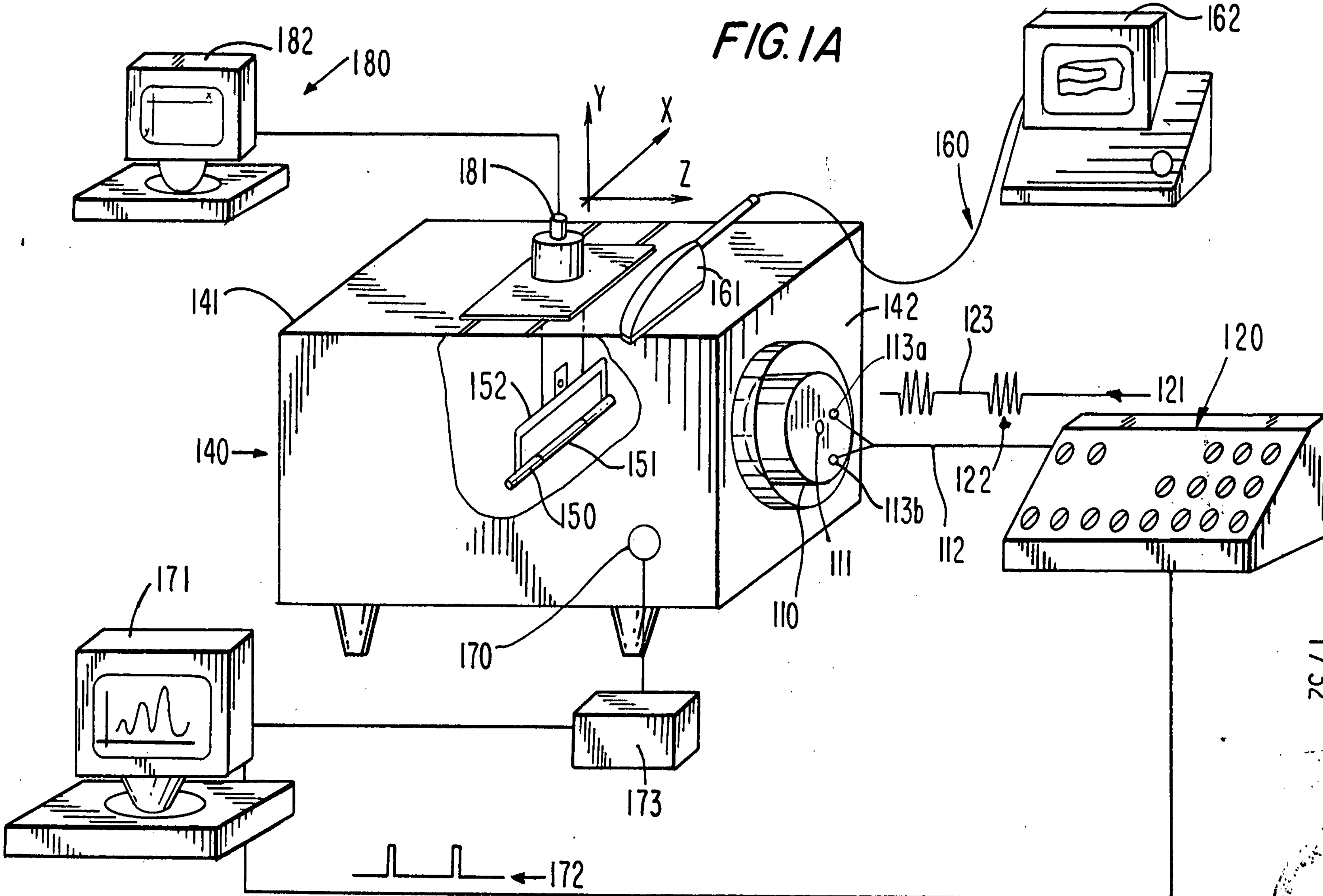
FIG. 1A


182
180
181
Y
X
Z
162
160
161
141
142
123
120
113a
152
121
140
151
122
113b
150
112
111
110
170
171
173
172

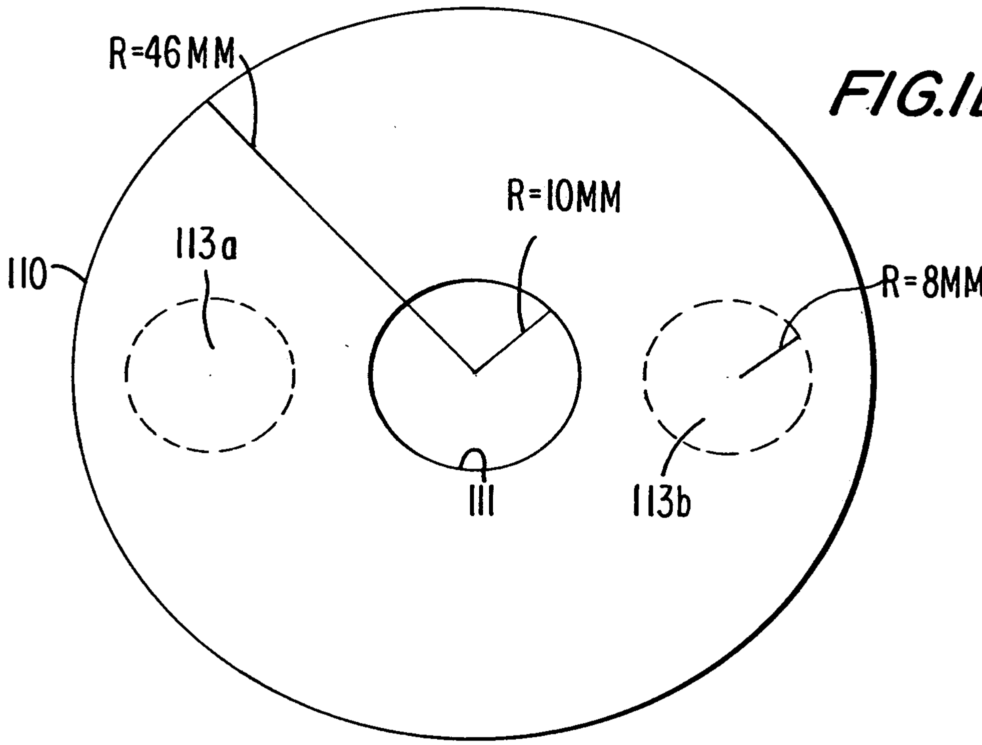

R=46MM
R=10MM
113a
110
R=8MM
111
113b

FIG.1B

FIG.1C

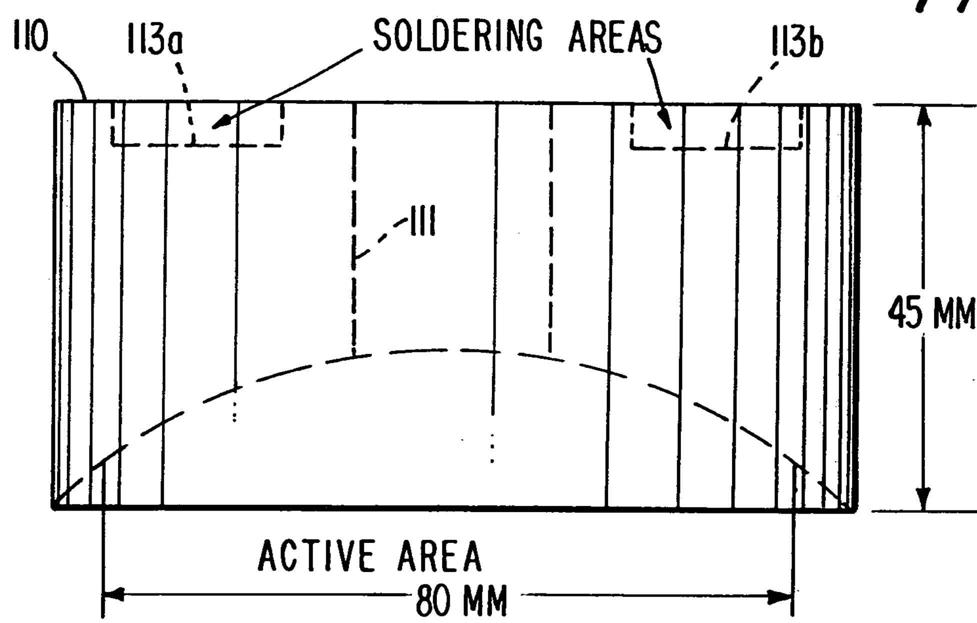
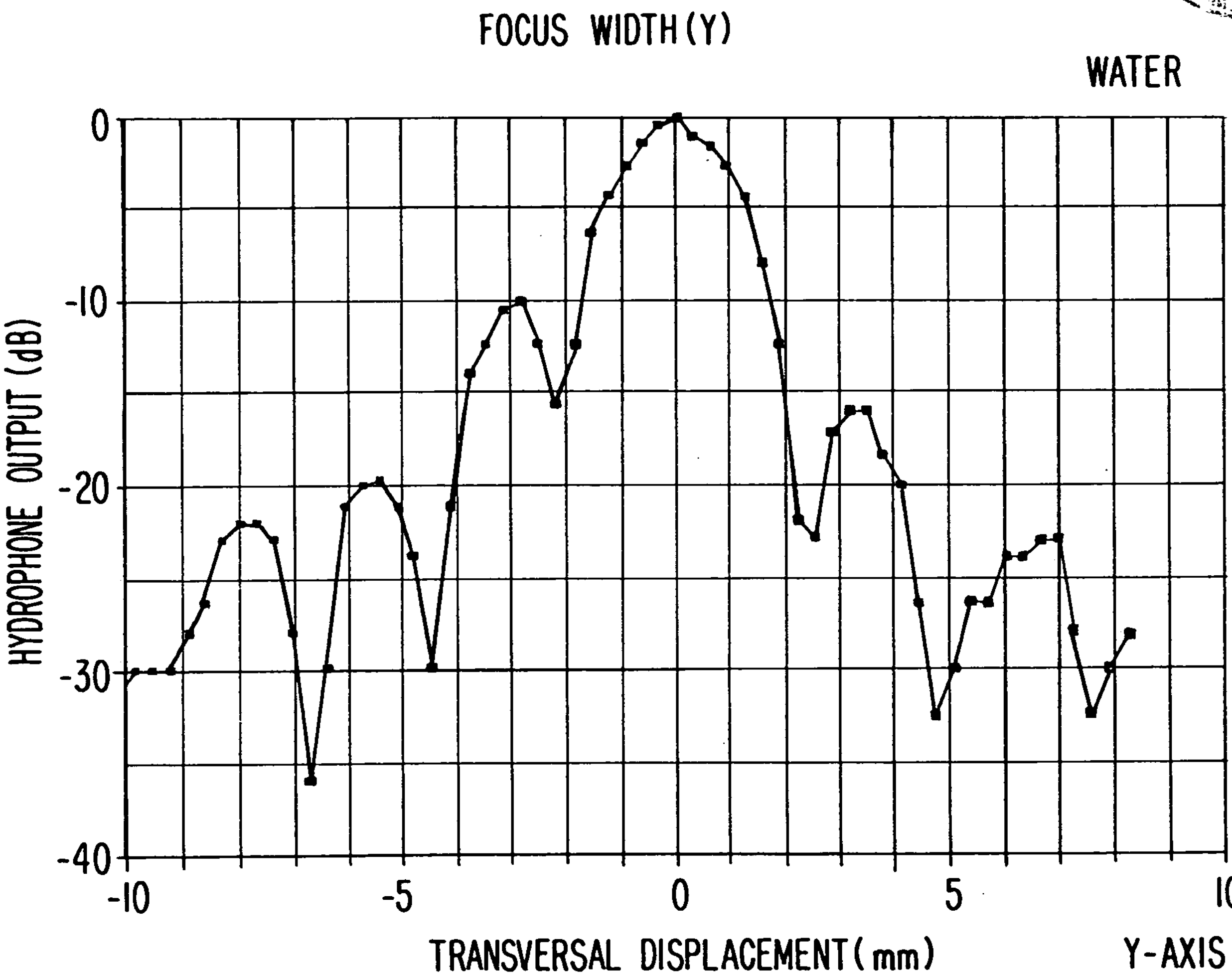

110
113a
SOLDERING AREAS
113b
111
45 MM
ACTIVE AREA
80 MM

FIG. 2



t = 20 µs, T = 74 ms, 46V

FIG. 3

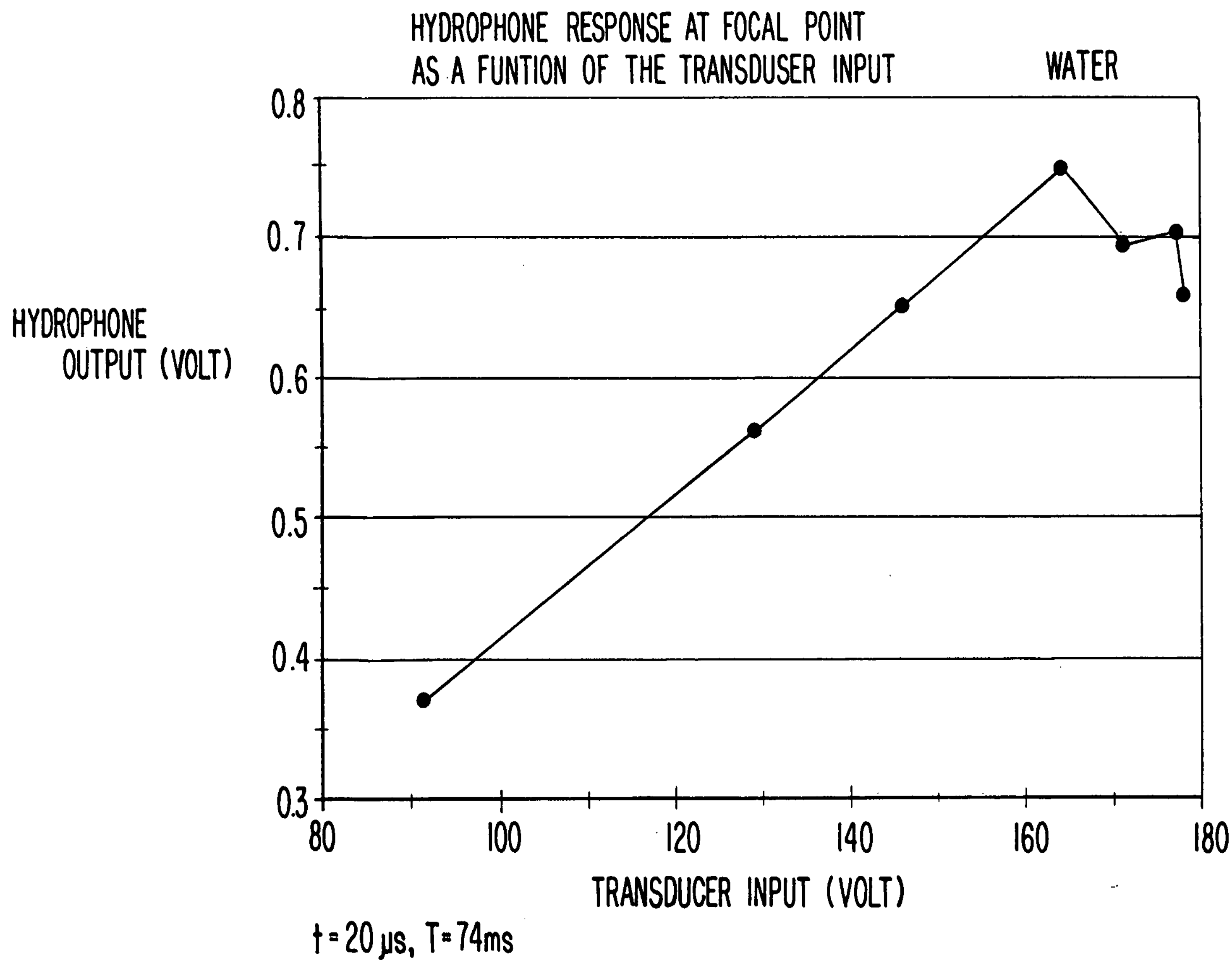

HYDROPHONE RESPONSE AT FOCAL POINT
AS A FUNTION OF THE TRANSDUSER INPUT
WATER
HYDROPHONE
OUTPUT (VOLT)
0.8
0.7
0.6
0.5
0.4
0.3
80
100
120
140
160
180
TRANSDUCER INPUT (VOLT)
t = 20 µs, T = 74ms

FIG. 4

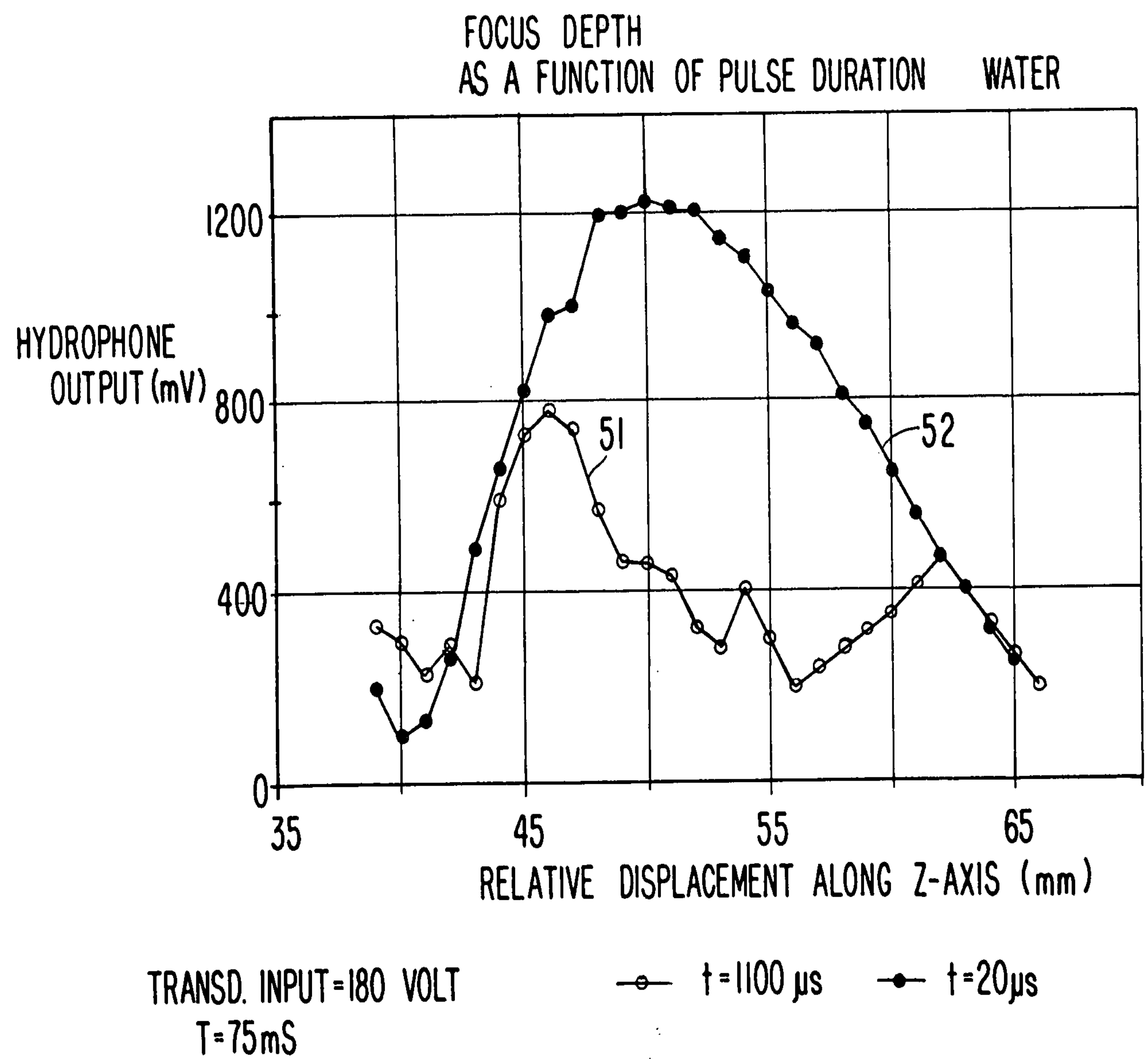
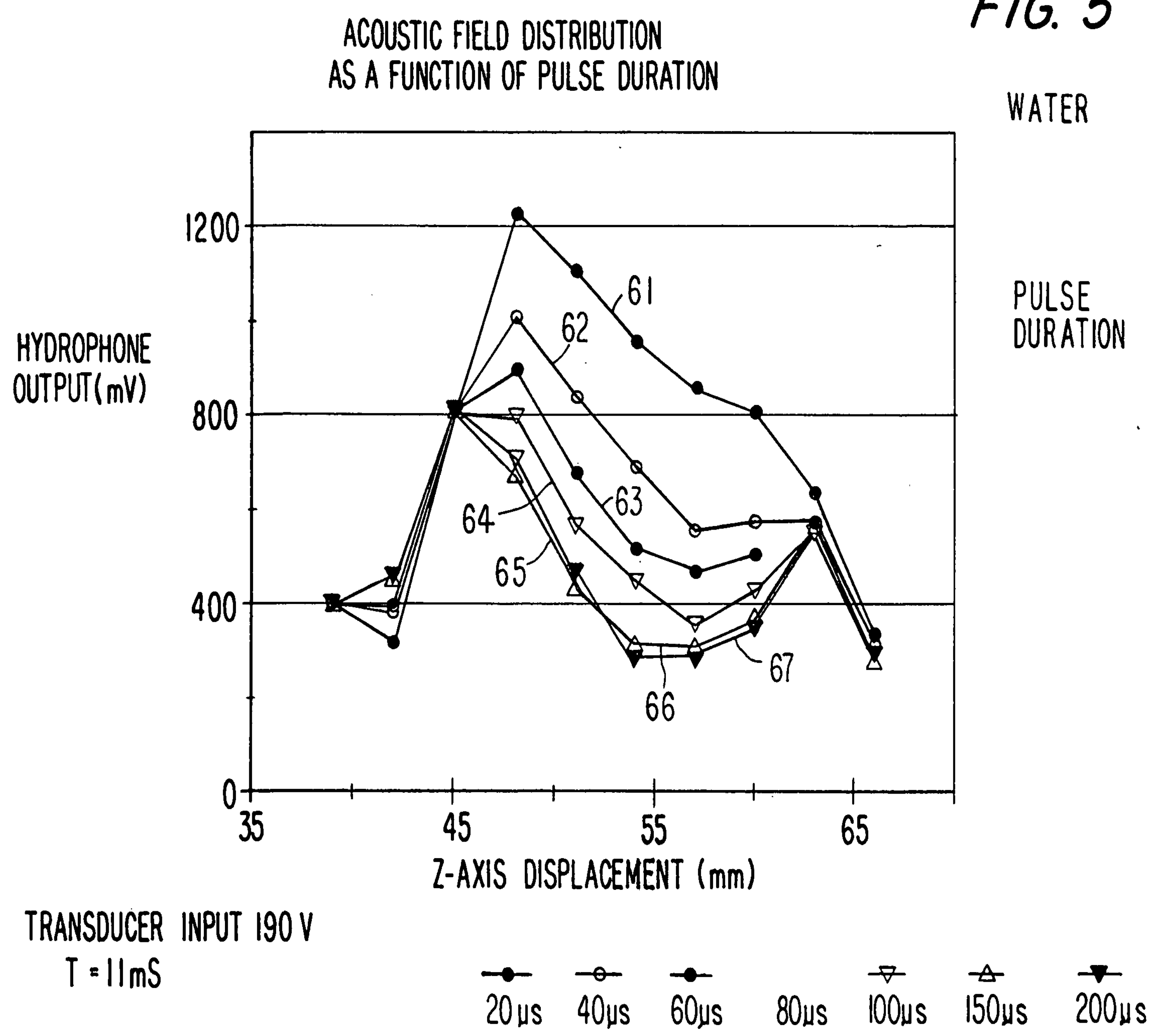

FOCUS DEPTH
AS A FUNCTION OF PULSE DURATION WATER
HYDROPHONE OUTPUT (mV)
1200
800
400
0
35
45
55
65
RELATIVE DISPLACEMENT ALONG Z-AXIS (mm)
51
52
TRANSD. INPUT=180 VOLT
T=75mS
t=1100 µs
t=20µs

FIG. 5



ACOUSTIC FIELD DISTRIBUTION
AS A FUNCTION OF PULSE DURATION
WATER
PULSE DURATION
HYDROPHONE OUTPUT(mV)
1200
800
400
0
35
45
55
65
Z-AXIS DISPLACEMENT (mm)
61
62
63
64
65
66
67
TRANSDUCER INPUT 190 V
T = 11mS
20μs
40μs
60μs
80μs
100μs
150μs
200μs

ACOUSTIC FIELD AS A FUNCTION OF
ELECTRIC INPUT TO TRANSDUCER

WATER

FIG. 6

TRANSDUCER
INPUT

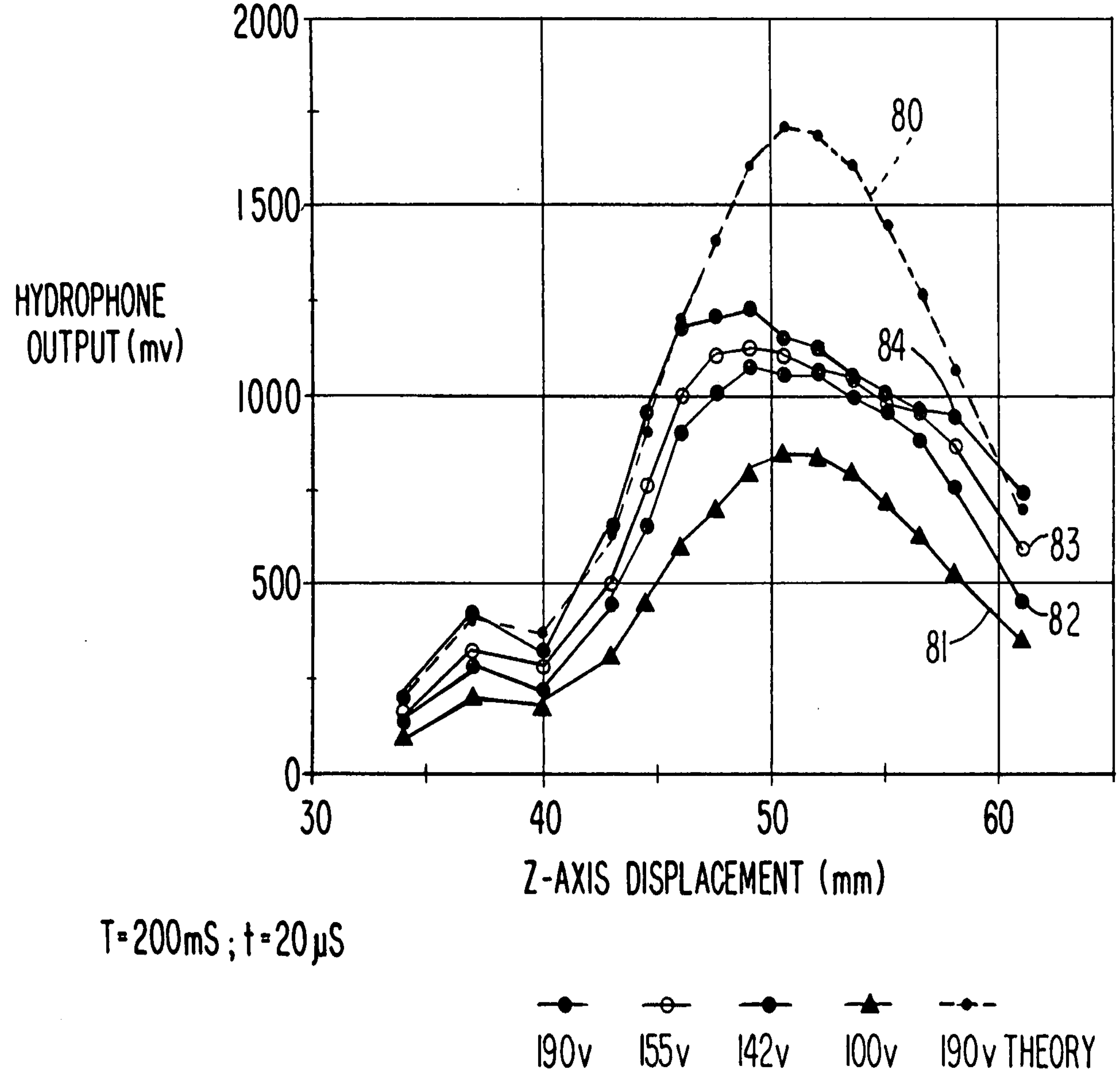


FIG. 7

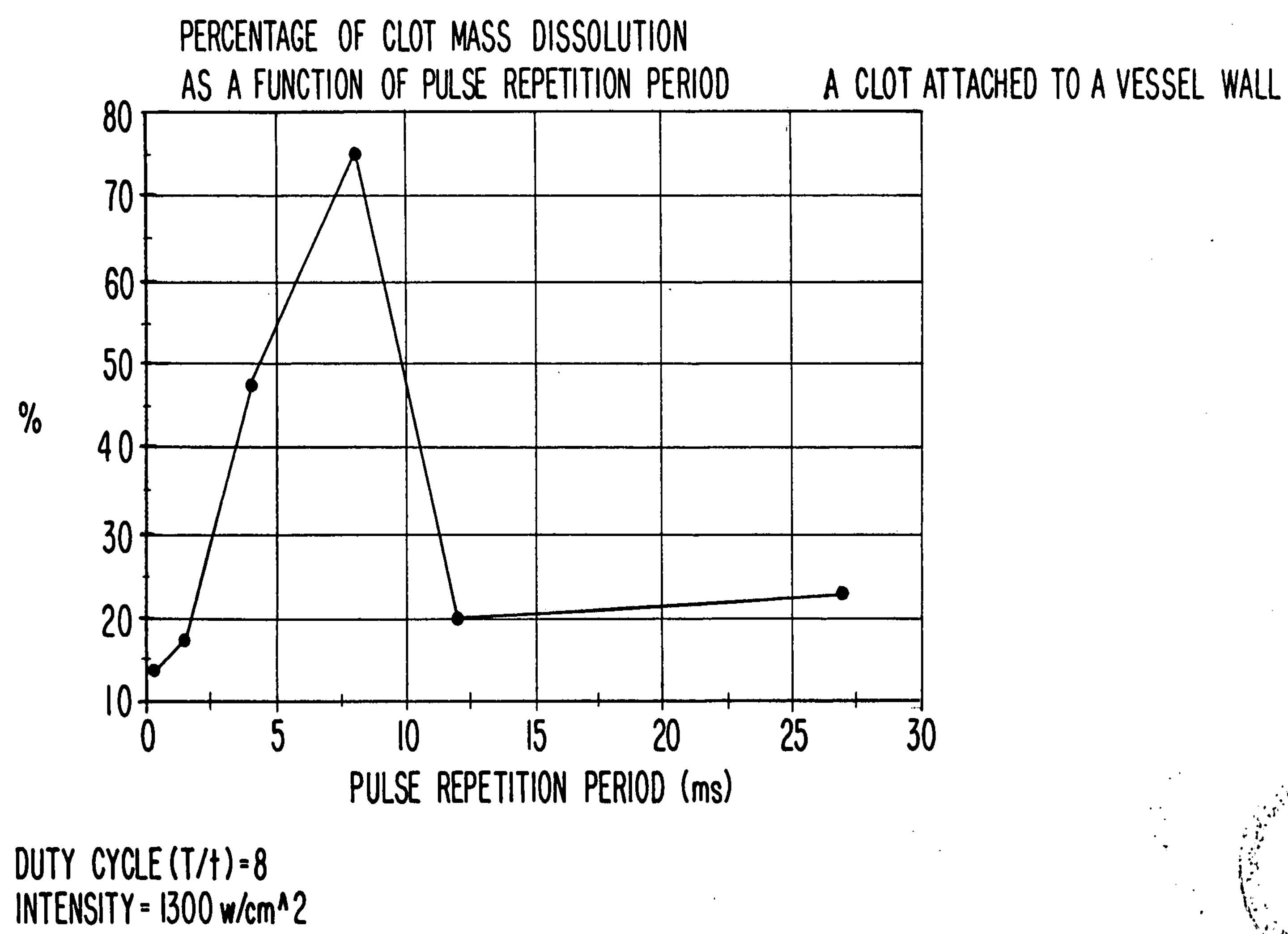

PERCENTAGE OF CLOT MASS DISSOLUTION
AS A FUNCTION OF PULSE REPETITION PERIOD
A CLOT ATTACHED TO A VESSEL WALL
%
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
PULSE REPETITION PERIOD (ms)
DUTY CYCLE (T/t)=8
INTENSITY=1300 w/cm^2

FIG. 8

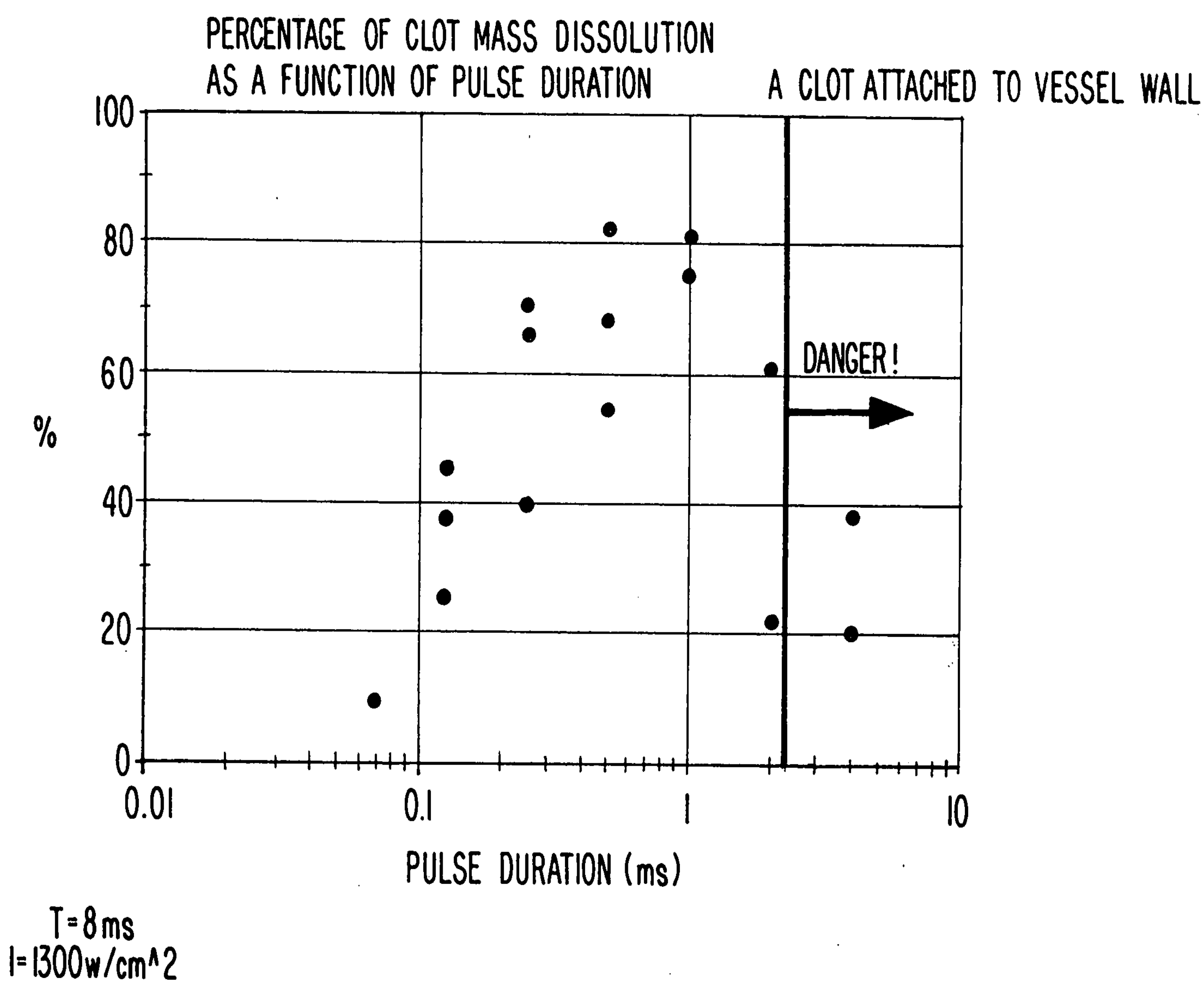
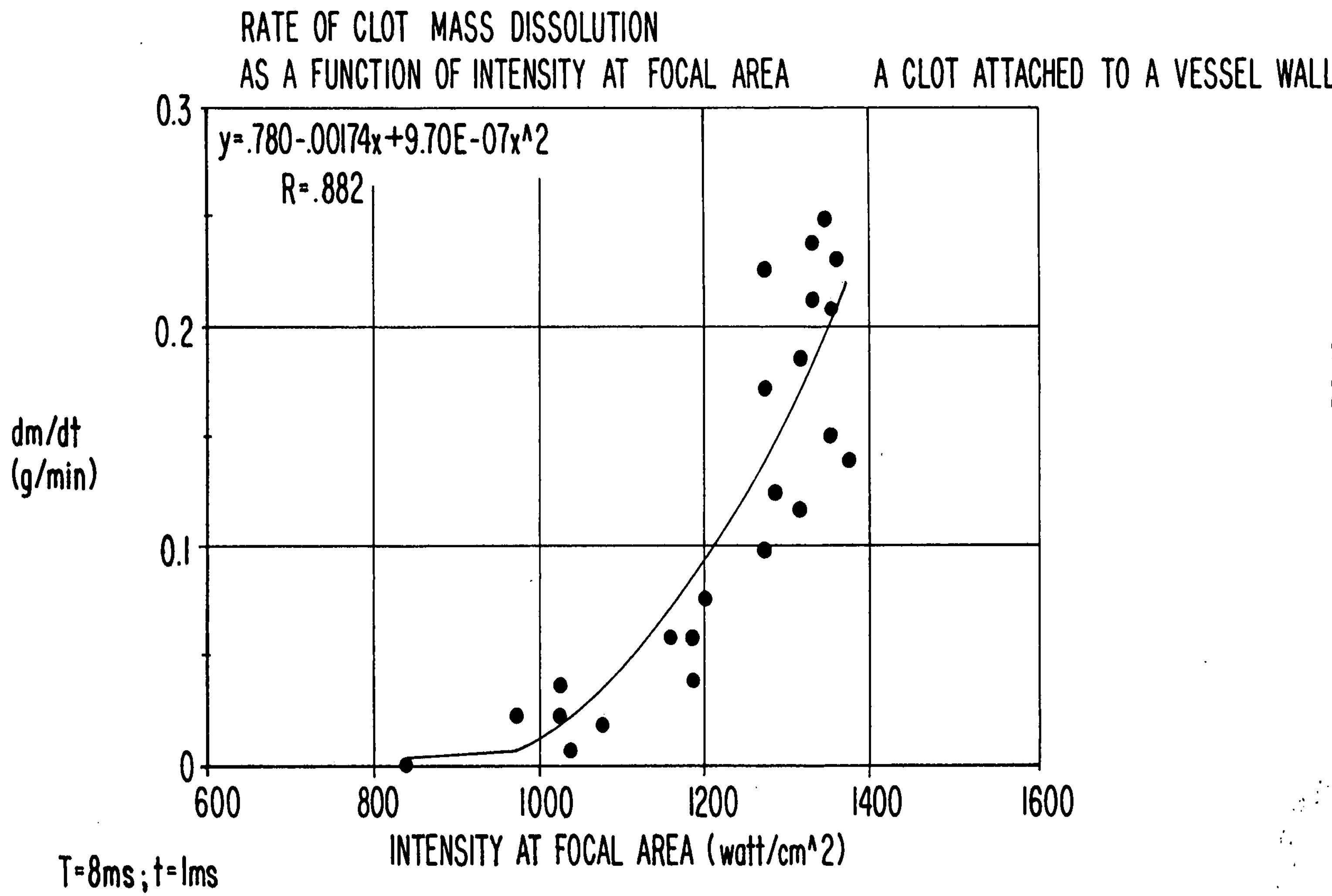

PERCENTAGE OF CLOT MASS DISSOLUTION
AS A FUNCTION OF PULSE DURATION
A CLOT ATTACHED TO VESSEL WALL
100
80
60
40
20
0
%
DANGER!
0.01
0.1
1
10
PULSE DURATION (ms)
T=8ms
I=1300w/cm^2

FIG. 9


RATE OF CLOT MASS DISSOLUTION
AS A FUNCTION OF INTENSITY AT FOCAL AREA
A CLOT ATTACHED TO A VESSEL WALL
y=.780-.00174x+9.70E-07x^2
R=.882
dm/dt
(g/min)
0.3
0.2
0.1
0
600
800
1000
1200
1400
1600
INTENSITY AT FOCAL AREA (watt/cm^2)
T=8ms; t=1ms

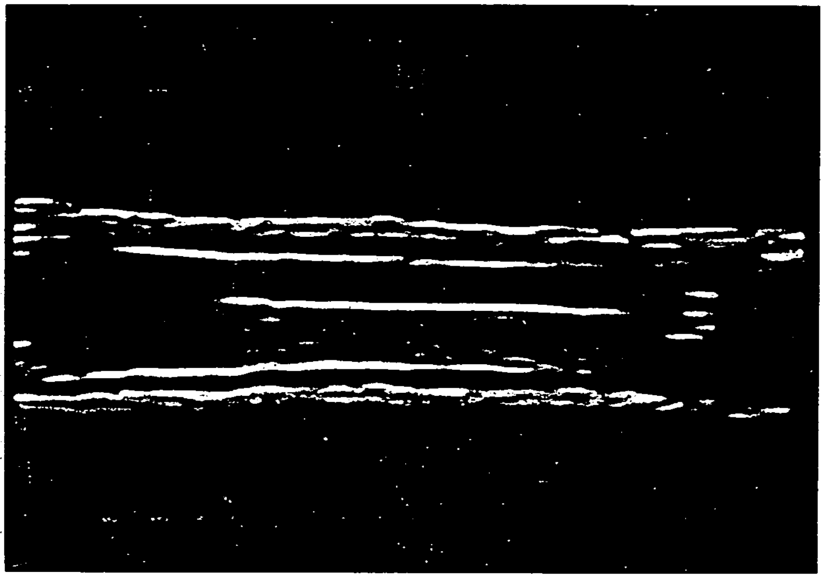


FIG. 10A

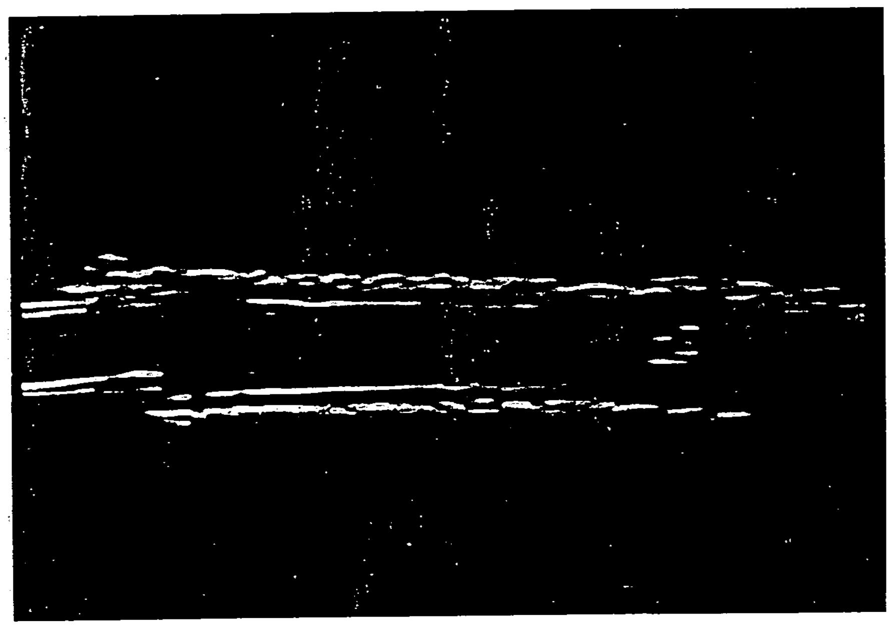
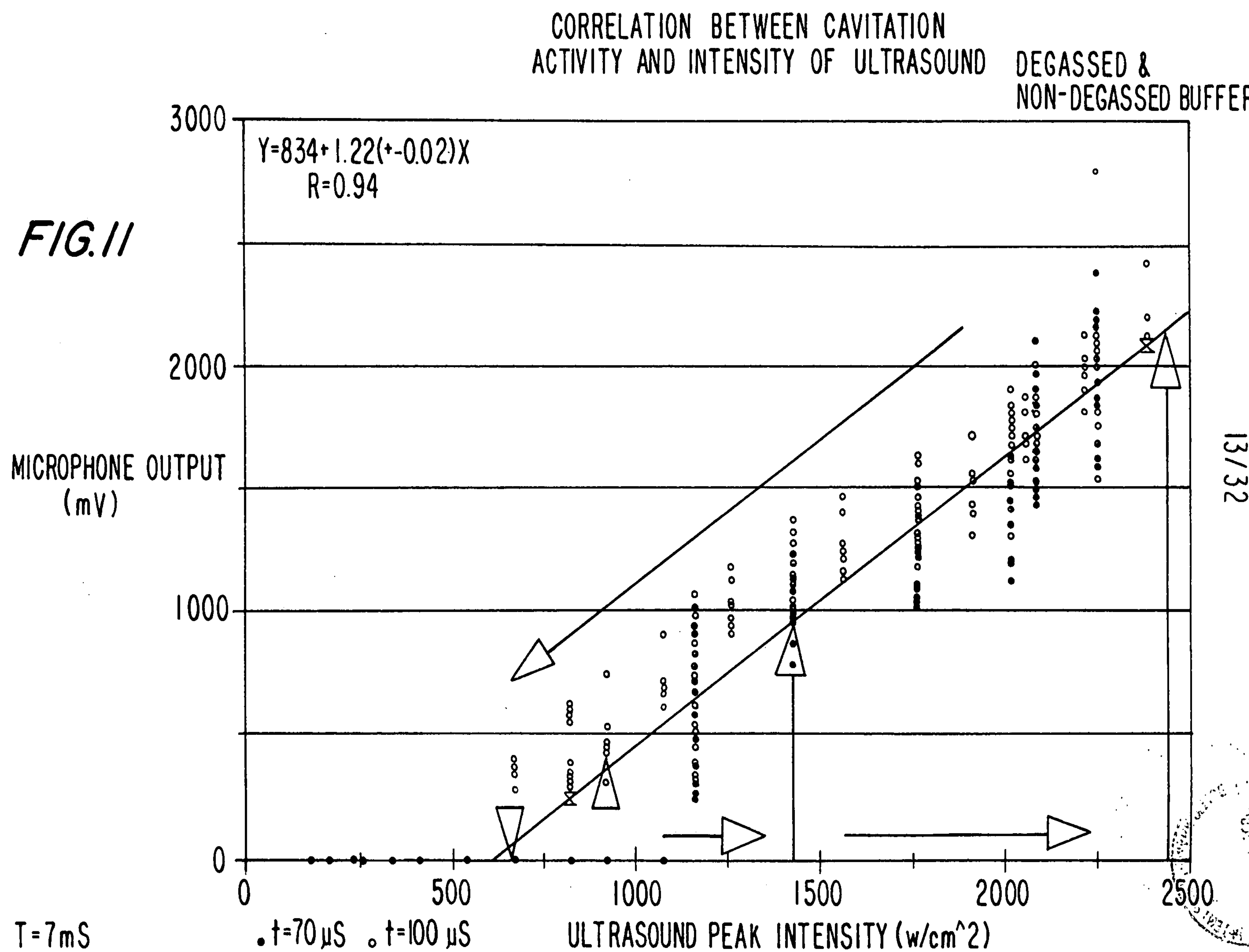


FIG. 10B

FIG. 11


CORRELATION BETWEEN CAVITATION ACTIVITY AND INTENSITY OF ULTRASOUND
DEGASSED & NON-DEGASSED BUFFER
Y=834+1.22(+-0.02)X
R=0.94
MICROPHONE OUTPUT (mV)
3000
2000
1000
0
0
500
1000
1500
2000
2500
ULTRASOUND PEAK INTENSITY (w/cm^2)
T=7mS
• t=70 µS ∘ t=100 µS

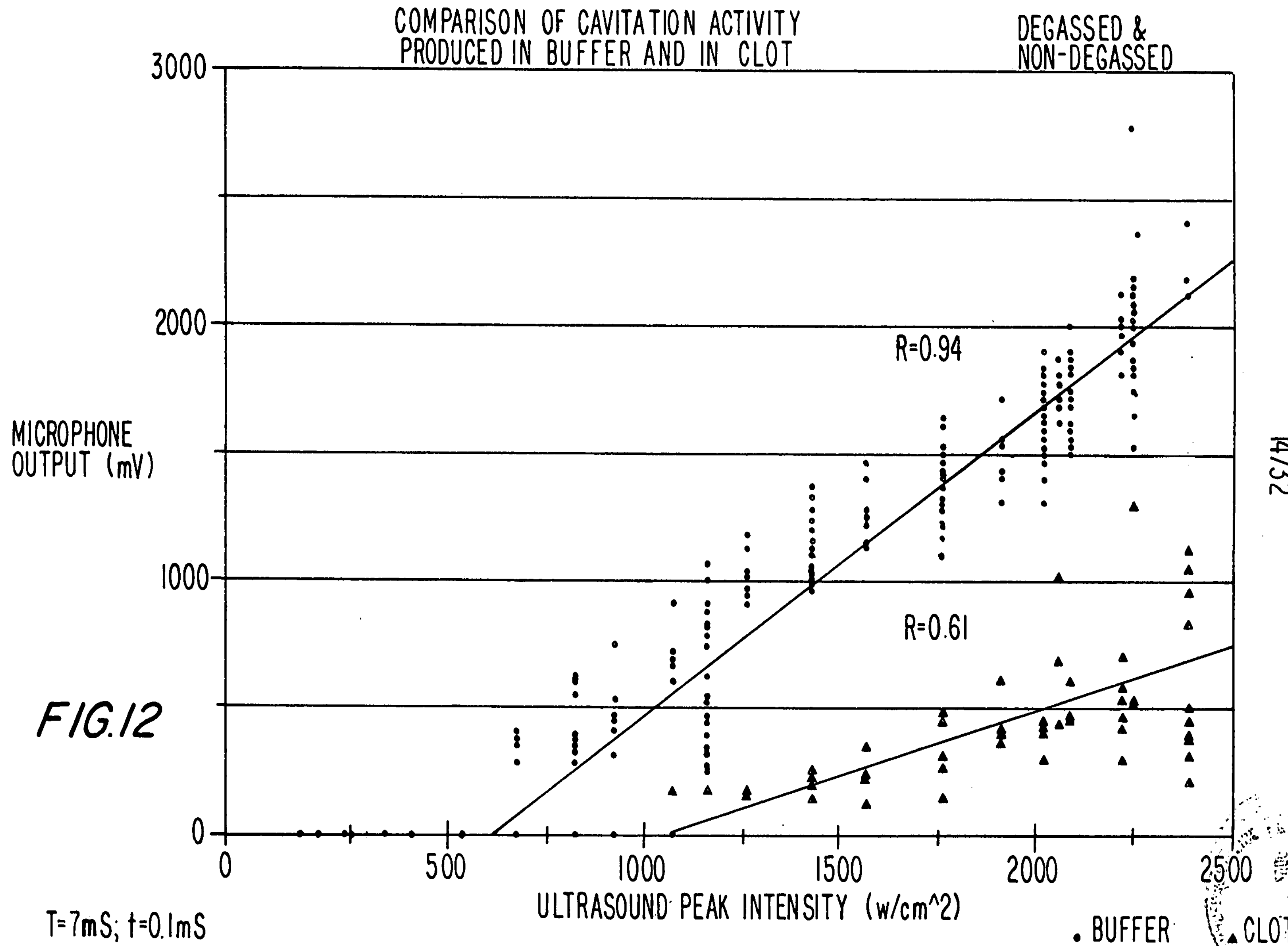

COMPARISON OF CAVITATION ACTIVITY
PRODUCED IN BUFFER AND IN CLOT
DEGASSED &
NON-DEGASSED
MICROPHONE
OUTPUT (mV)
3000
2000
1000
0
R=0.94
R=0.61
0
500
1000
1500
2000
2500
ULTRASOUND PEAK INTENSITY (w/cm^2)
T=7mS; t=0.1mS
BUFFER
CLOT

FIG.12

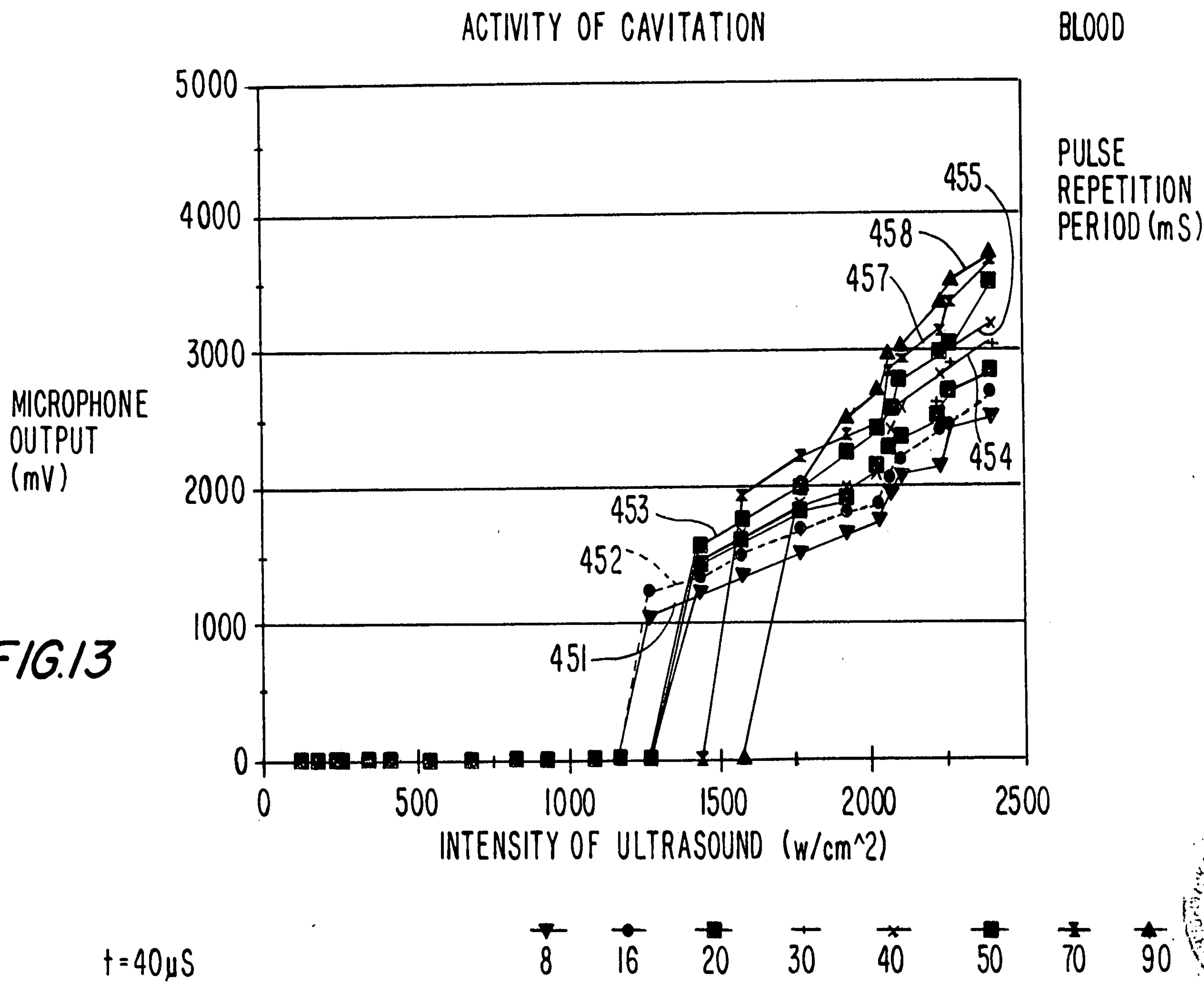

ACTIVITY OF CAVITATION
BLOOD
PULSE REPETITION PERIOD (mS)
MICROPHONE OUTPUT (mV)
5000
4000
3000
2000
1000
0
0
500
1000
1500
2000
2500
INTENSITY OF ULTRASOUND (w/cm^2)
455
458
457
454
453
452
451
t=40μS
8
16
20
30
40
50
70
90

FIG.13

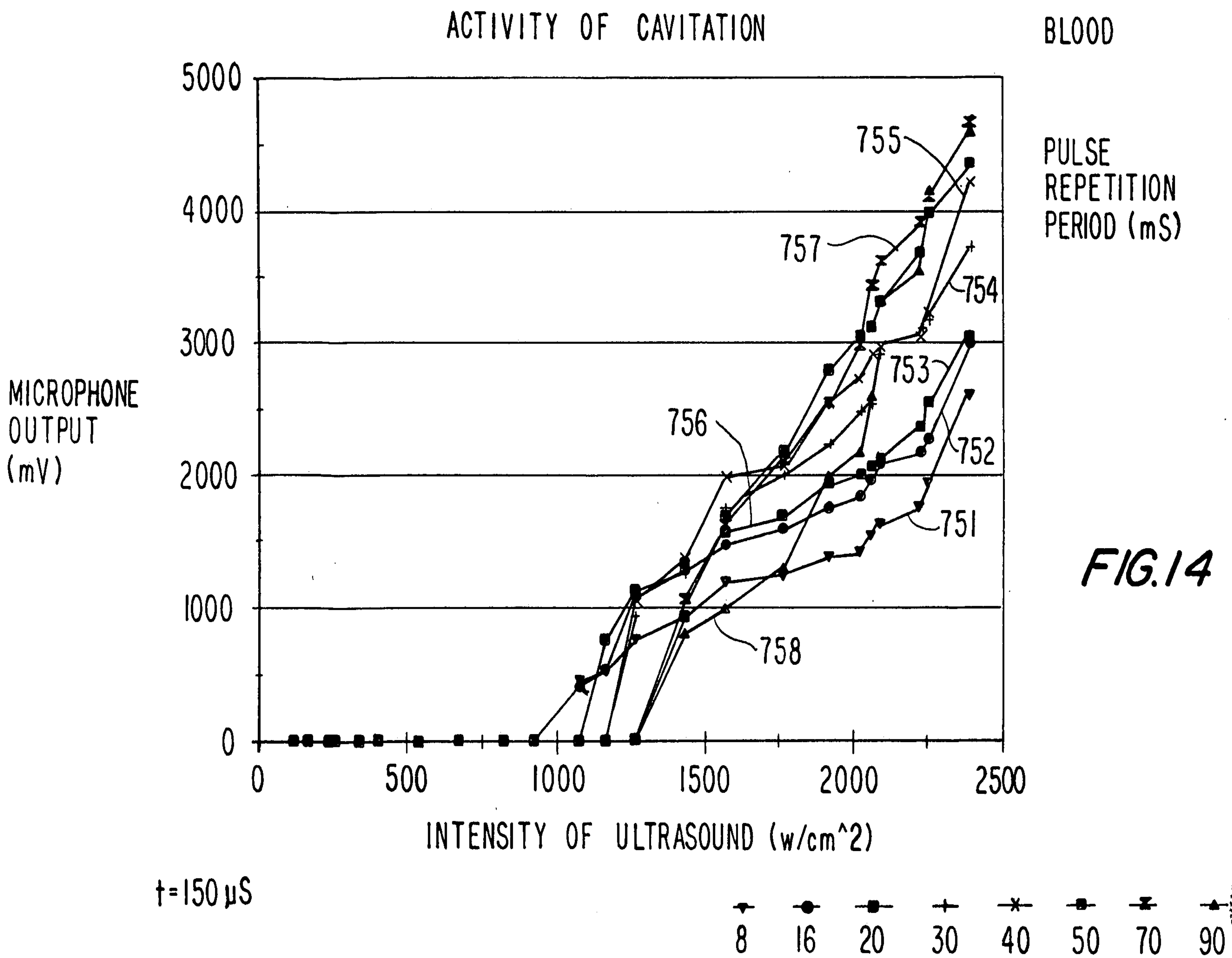
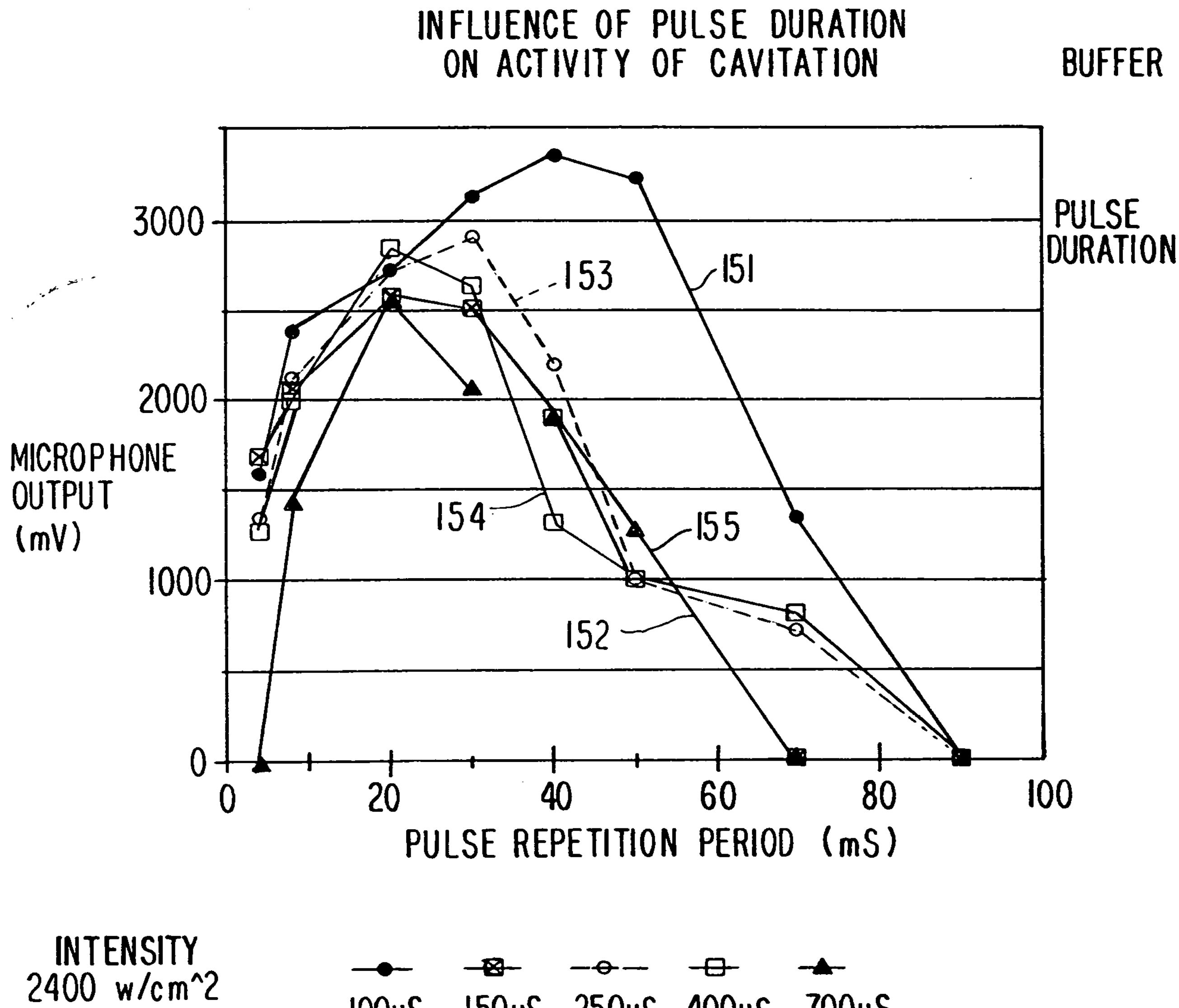
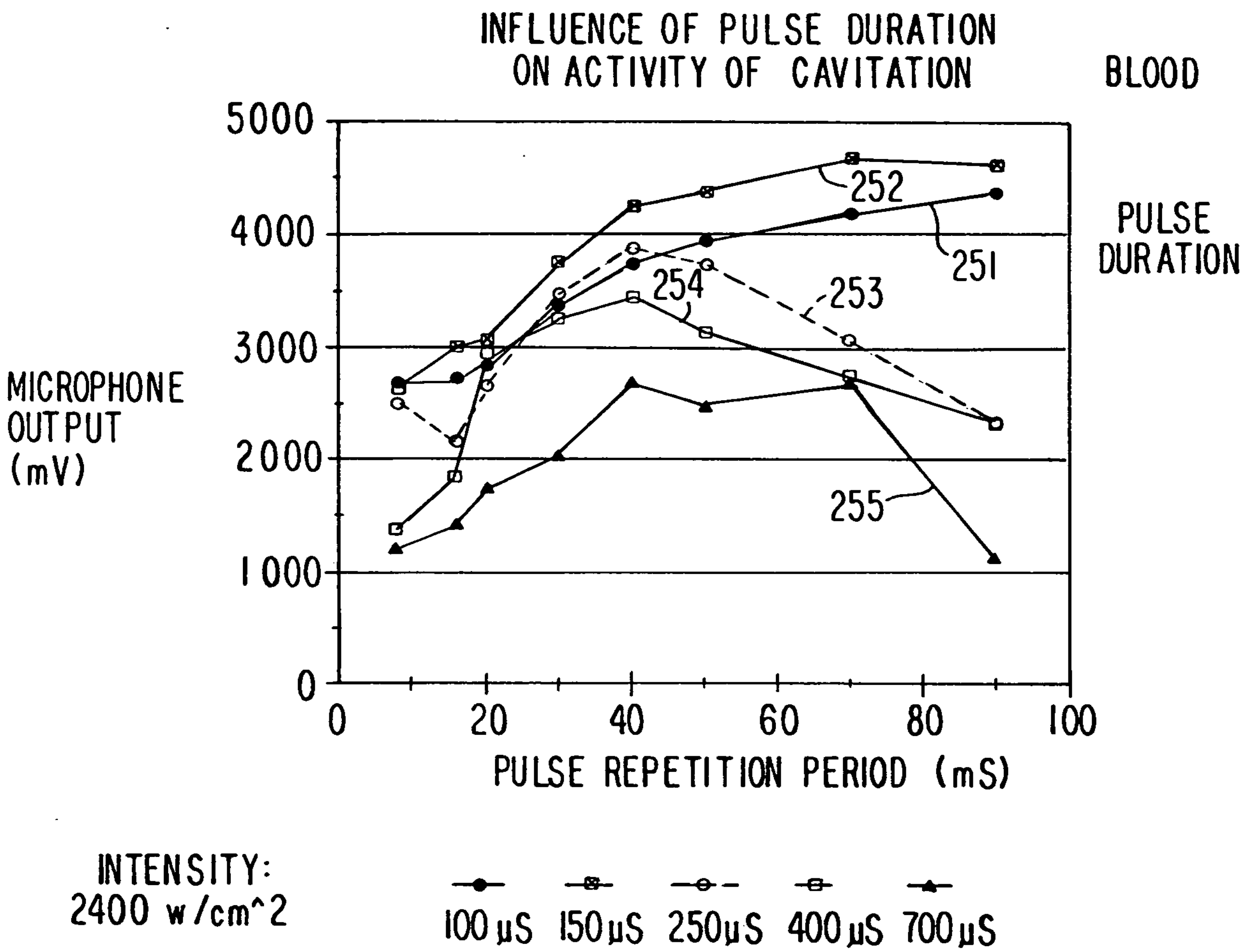

ACTIVITY OF CAVITATION
BLOOD
MICROPHONE OUTPUT (mV)
5000
4000
3000
2000
1000
0
0
500
1000
1500
2000
2500
INTENSITY OF ULTRASOUND (w/cm^2)
PULSE REPETITION PERIOD (mS)
751
752
753
754
755
756
757
758
t=150 µS
8
16
20
30
40
50
70
90

FIG.14



INFLUENCE OF PULSE DURATION
ON ACTIVITY OF CAVITATION
BUFFER
PULSE
DURATION
3000
2000
1000
0
MICROPHONE
OUTPUT
(mV)
0
20
40
60
80
100
PULSE REPETITION PERIOD (mS)
151
152
153
154
155
INTENSITY
2400 w/cm^2
100µS
150µS
250µS
400µS
700µS

FIG. 15



INFLUENCE OF PULSE DURATION
ON ACTIVITY OF CAVITATION
BLOOD
PULSE
DURATION
MICROPHONE
OUTPUT
(mV)
5000
4000
3000
2000
1000
0
0
20
40
60
80
100
PULSE REPETITION PERIOD (mS)
252
251
254
253
255
INTENSITY:
2400 w/cm^2
100 µS
150 µS
250 µS
400 µS
700 µS

FIG. 16

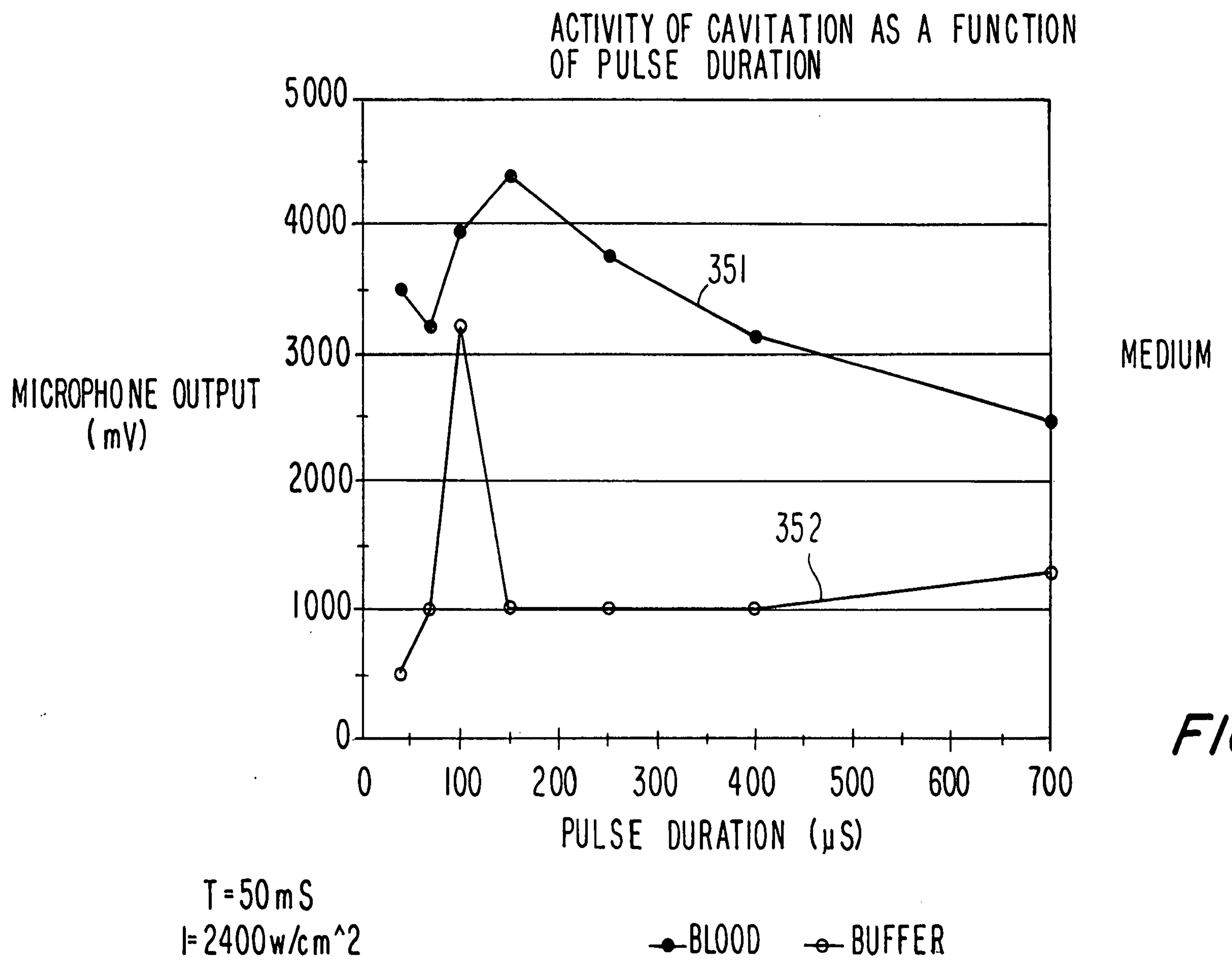

ACTIVITY OF CAVITATION AS A FUNCTION OF PULSE DURATION
MICROPHONE OUTPUT (mV)
5000
4000
3000
2000
1000
0
0
100
200
300
400
500
600
700
PULSE DURATION (μS)
351
352
MEDIUM
T=50mS
I=2400w/cm^2
BLOOD
BUFFER

FIG. 17

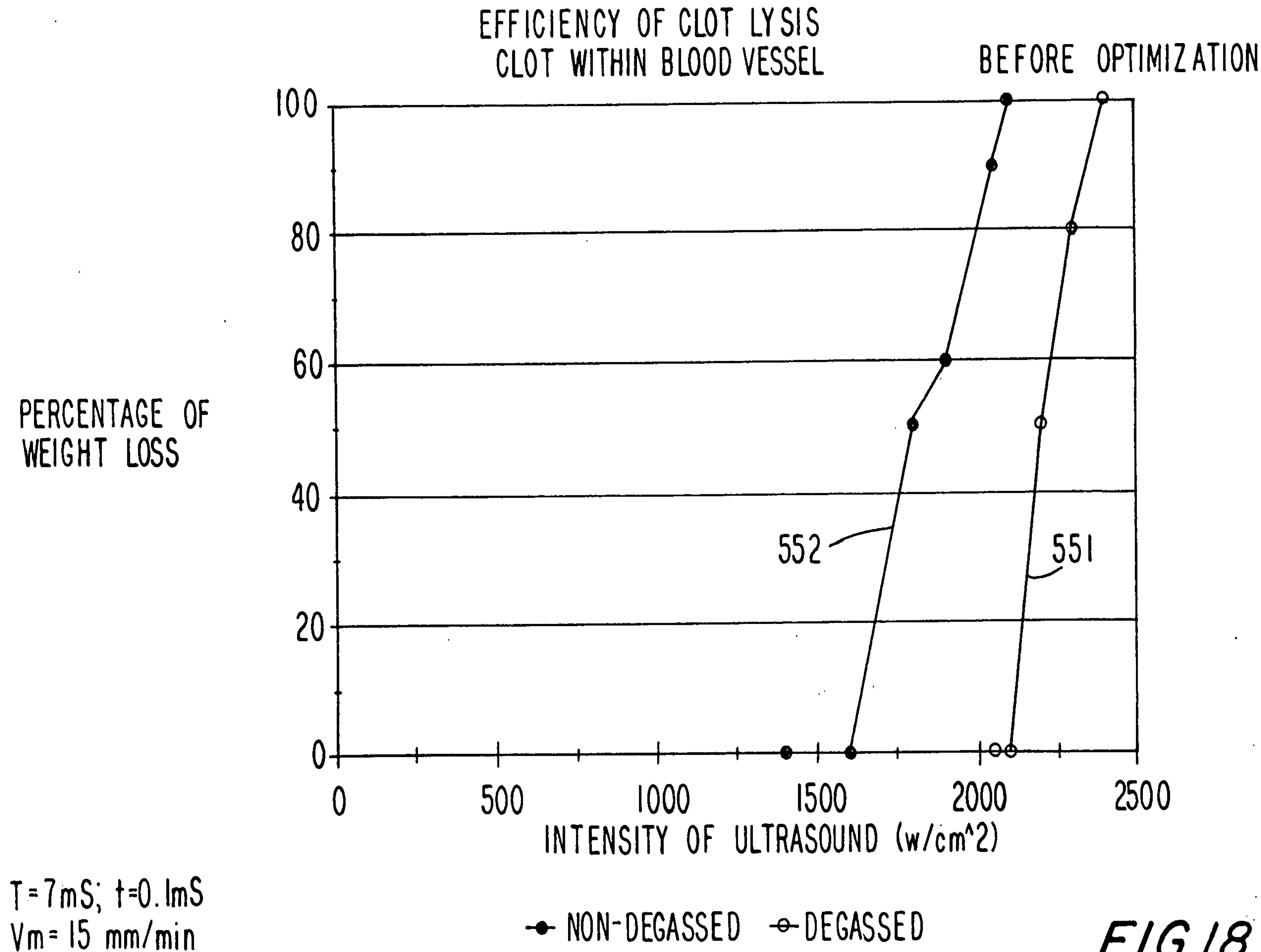
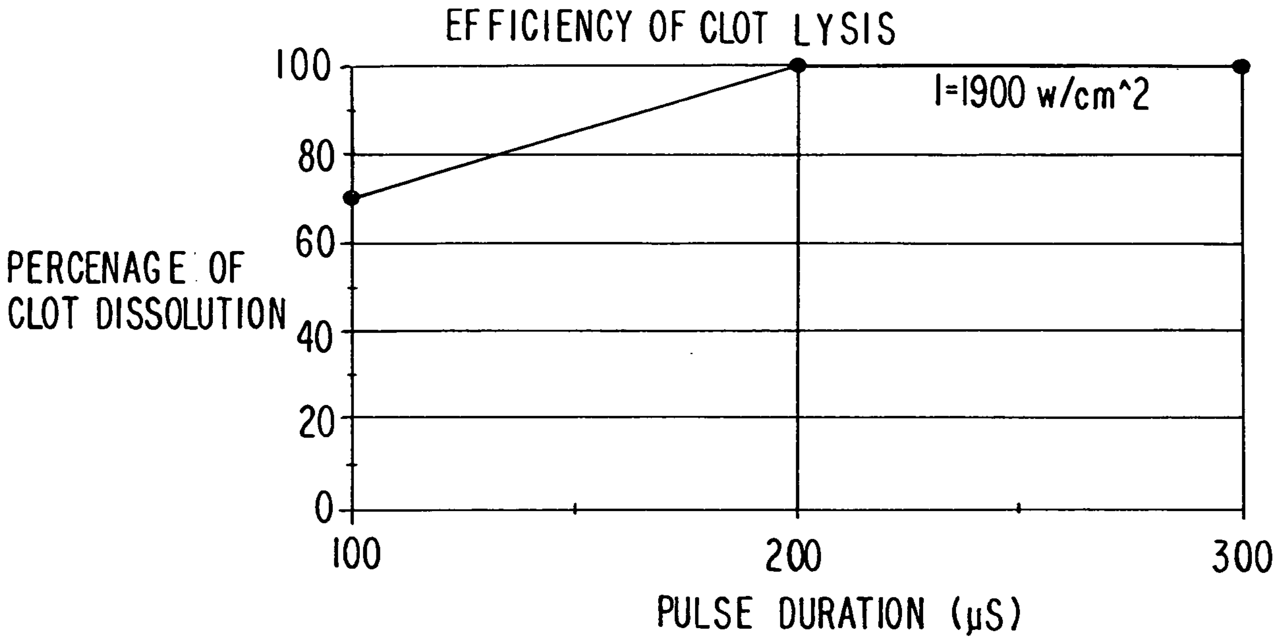

EFFICIENCY OF CLOT LYSIS
CLOT WITHIN BLOOD VESSEL
BEFORE OPTIMIZATION
PERCENTAGE OF
WEIGHT LOSS
100
80
60
40
20
0
0
500
1000
1500
2000
2500
INTENSITY OF ULTRASOUND (w/cm^2)
552
551
T=7mS; t=0.1mS
Vm=15 mm/min
NON-DEGASSED
DEGASSED

FIG.18

SEARCH FOR OPTIMUM TIME PARAMETERS
OF PULSED MODE SONIFICATION

FIG.19A

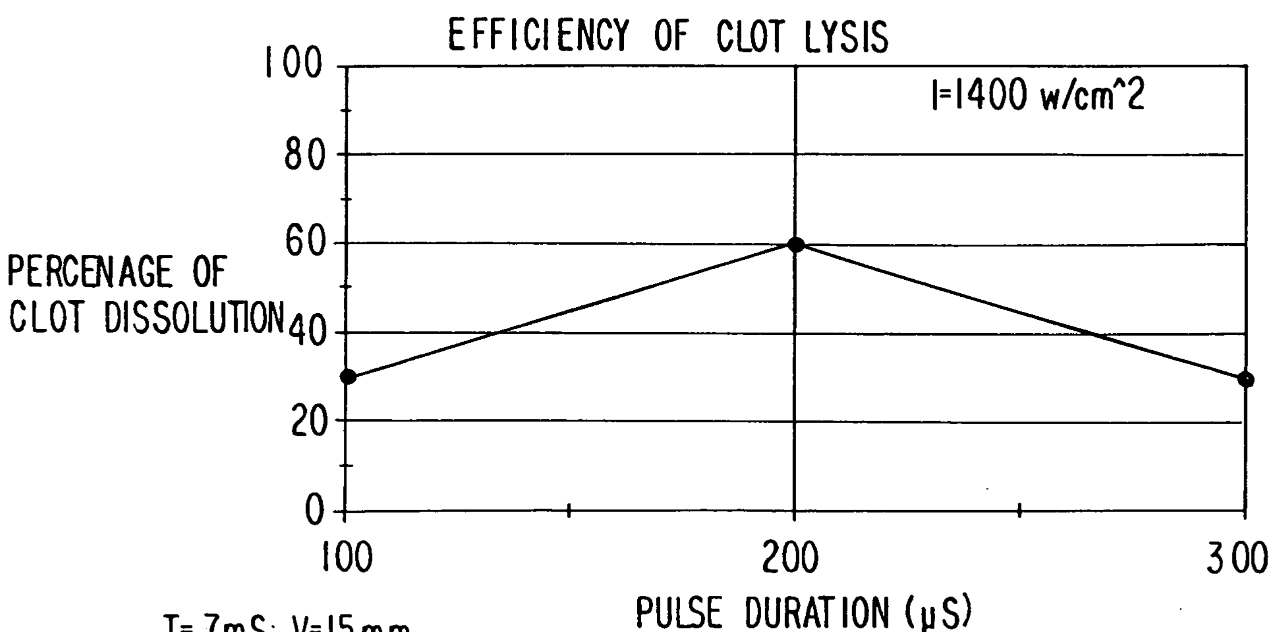
CLOT WITHIN BLOOD VESSEL



SEARCH FOR OPTIMUM TIME PARAMETER
OF PULSED MODE SONIFICATION

FIG.19B

CLOT WITHIN BLOOD VESSEL



T= 7mS; V=15mm

FIG. 20A

SEARCH FOR OPTIMUM TIME PARAMETERS OF PULSED MODE SONIFICATION

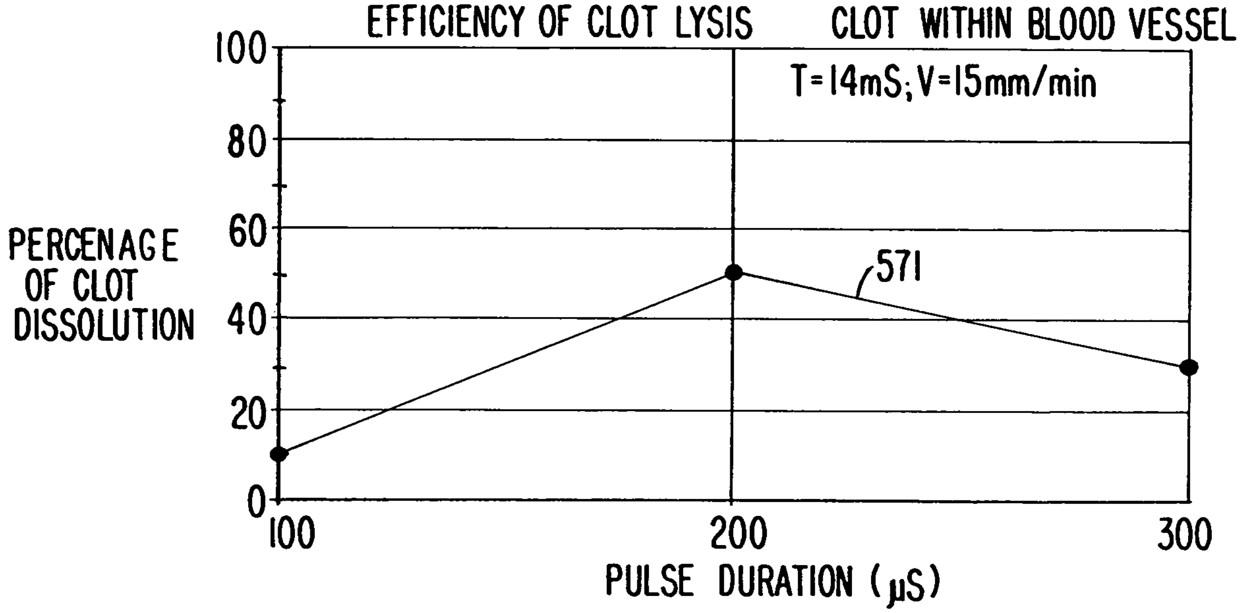


FIG. 20B

SEARCH FOR OPTIMUM TIME PARAMETERS OF PULSED MODE SONIFICATION

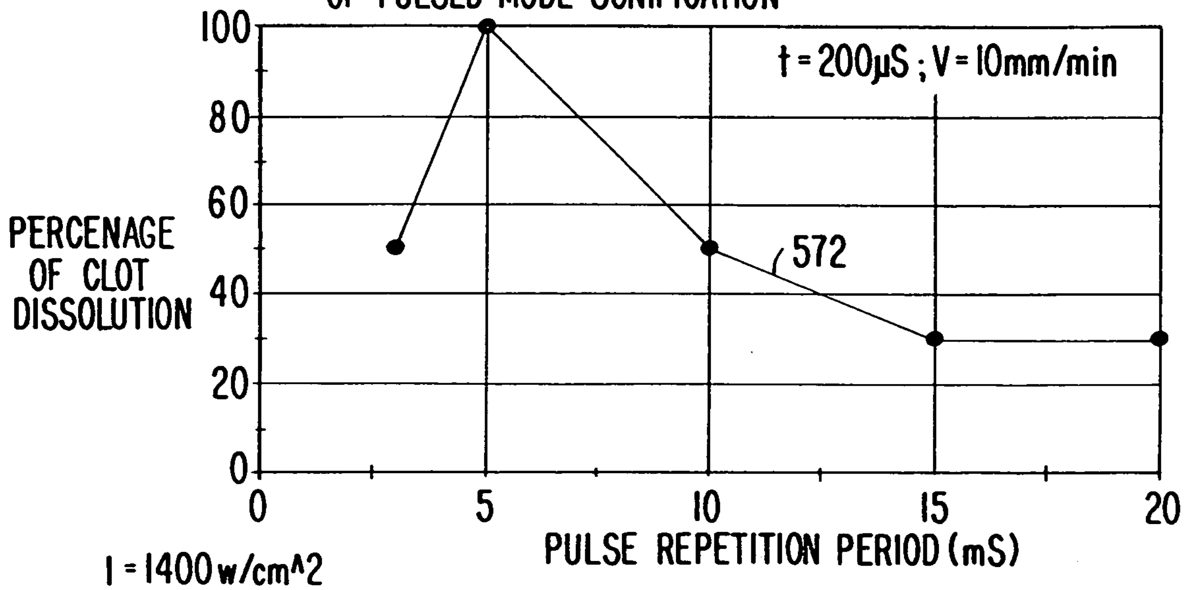


FIG.20C

SEARCH FOR OPTIMUM TIME PARAMETERS OF PULSED MODE SONIFICATION

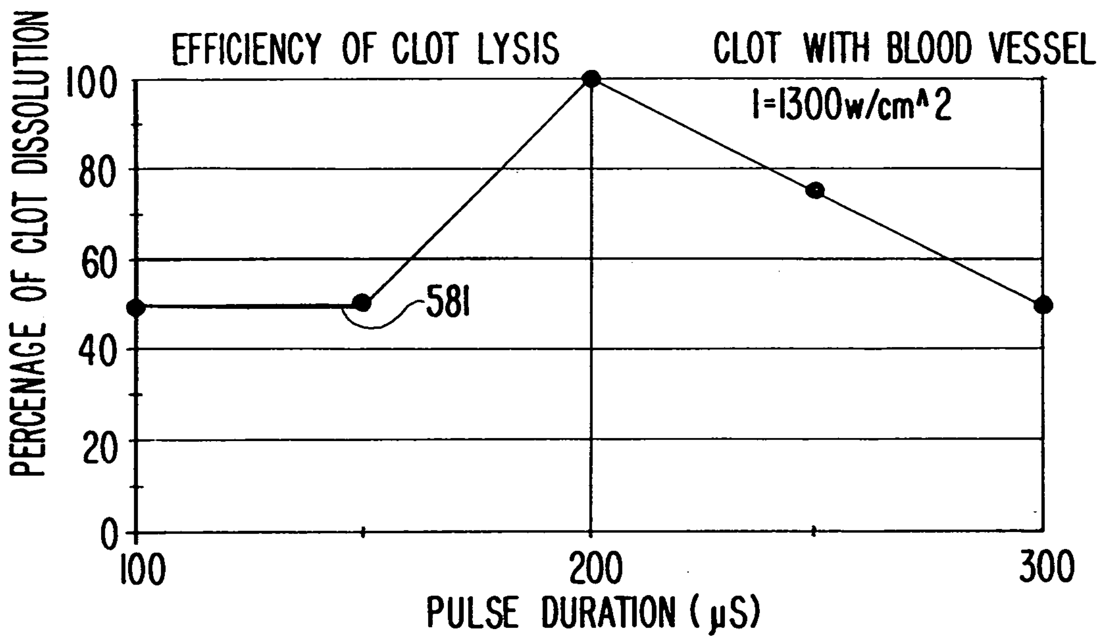
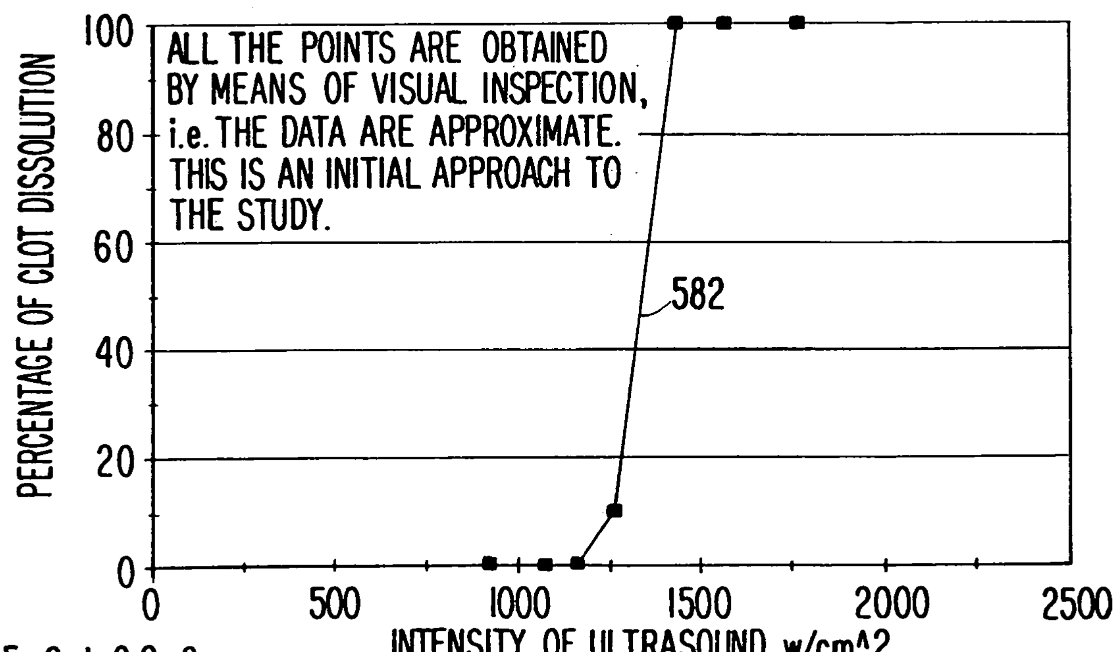


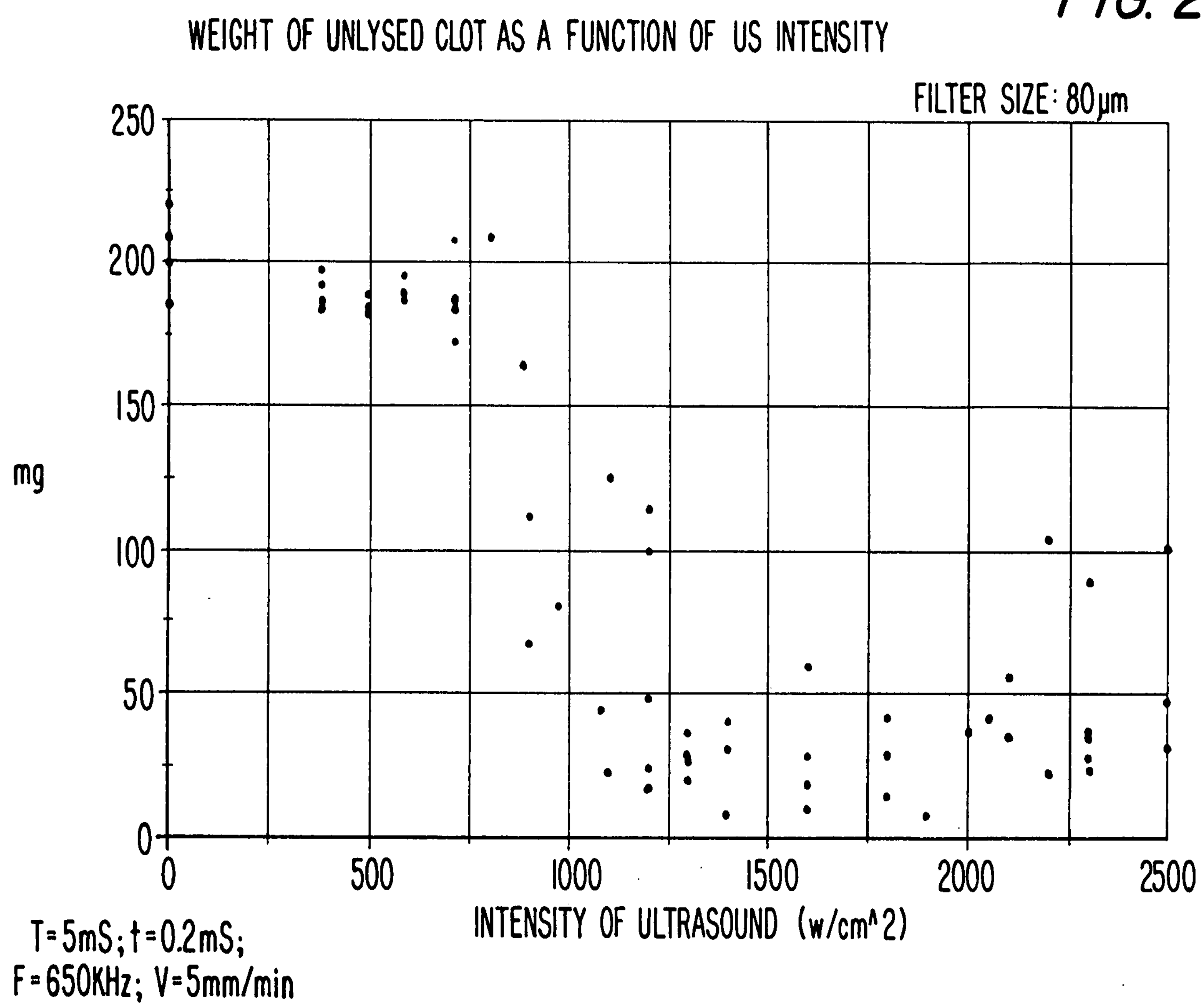
FIG.21

SEARCH FOR OPTIMUM TIME PARAMETERS OF PULSED MODE SONIFICATION



T=5mS; t=0.2mS
V=10mm/min

FIG. 22


WEIGHT OF UNLYSED CLOT AS A FUNCTION OF US INTENSITY
FILTER SIZE: 80μm
mg
250
200
150
100
50
0
0
500
1000
1500
2000
2500
INTENSITY OF ULTRASOUND (w/cm^2)
T=5mS; t=0.2mS;
F=650KHz; V=5mm/min

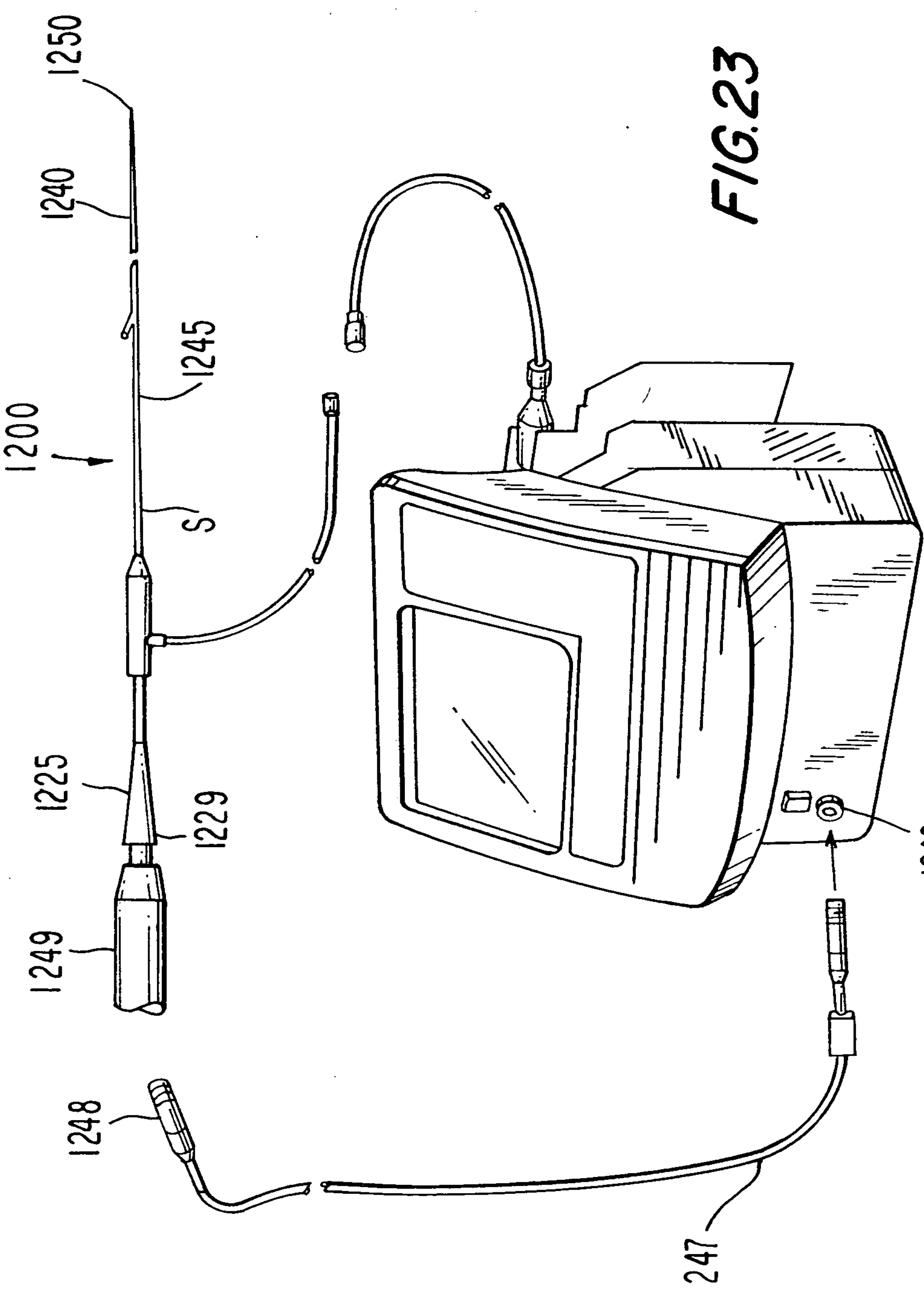
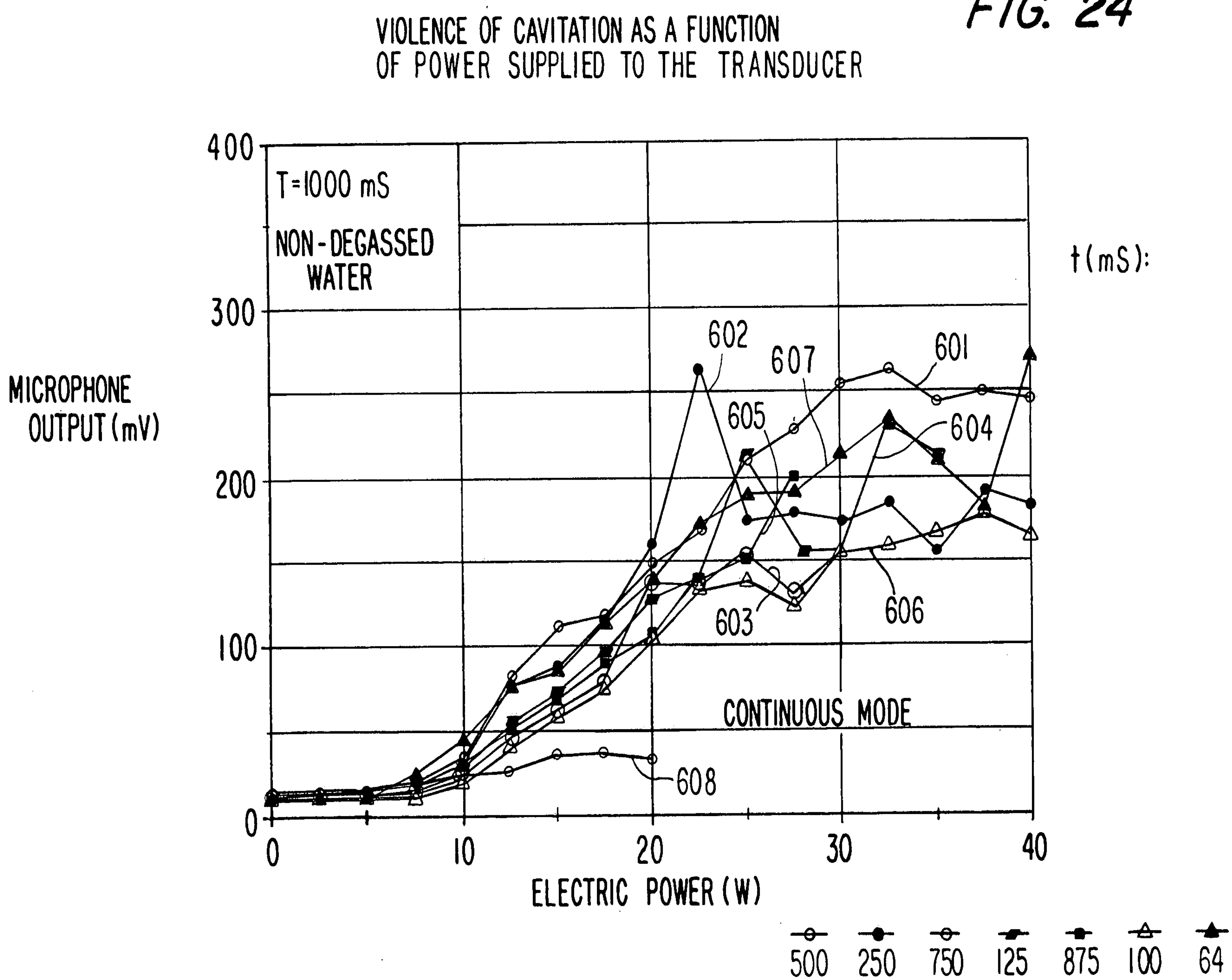


FIG.23

FIG. 24


VIOLENCE OF CAVITATION AS A FUNCTION
OF POWER SUPPLIED TO THE TRANSDUCER
MICROPHONE OUTPUT (mV)
400
300
200
100
0
T=1000 mS
NON-DEGASSED WATER
602
607
601
605
604
603
606
CONTINUOUS MODE
608
10
20
30
40
ELECTRIC POWER (W)
t(mS):
500
250
750
125
875
100
64

VIOLENCE OF CAVITATION AS A FUNCTION
OF POWER SUPPLIED TO THE TRANSDUCER

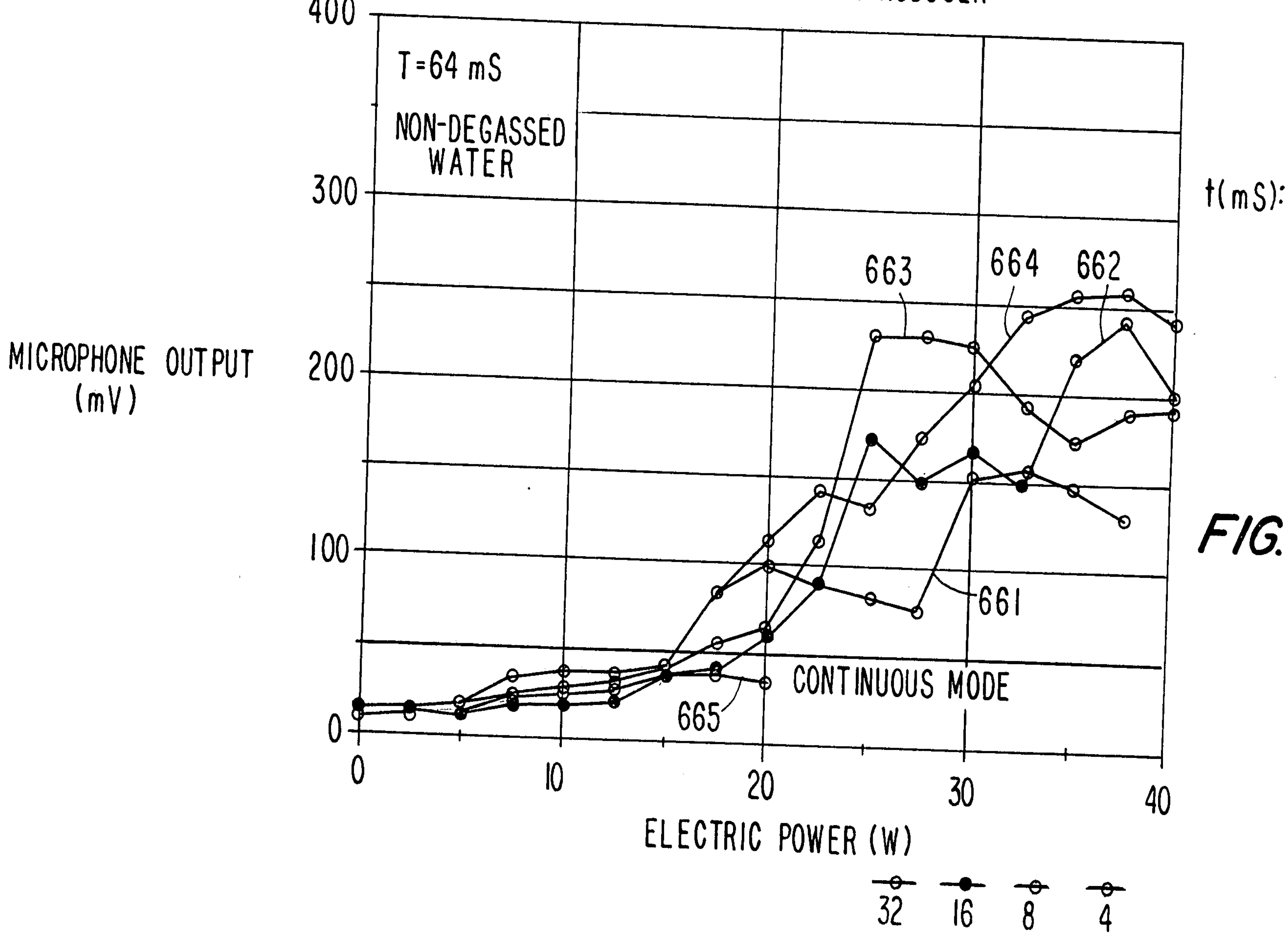


FIG. 26

FIG. 25

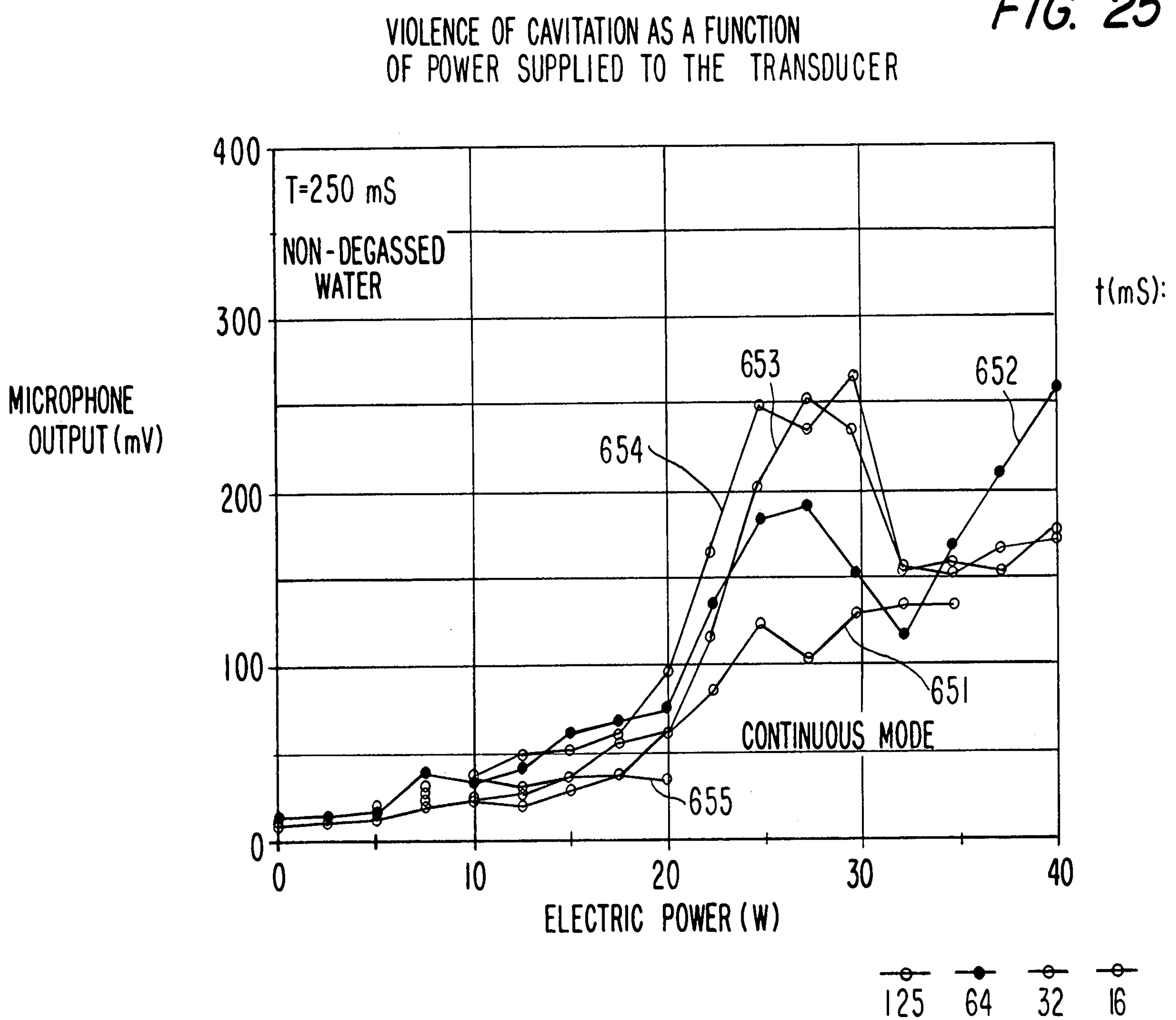

VIOLENCE OF CAVITATION AS A FUNCTION
OF POWER SUPPLIED TO THE TRANSDUCER
T=250 mS
NON-DEGASSED WATER
MICROPHONE OUTPUT (mV)
400
300
200
100
0
10
20
30
40
ELECTRIC POWER (W)
653
652
654
651
655
CONTINUOUS MODE
t(mS):
125
64
32
16

FIG.27

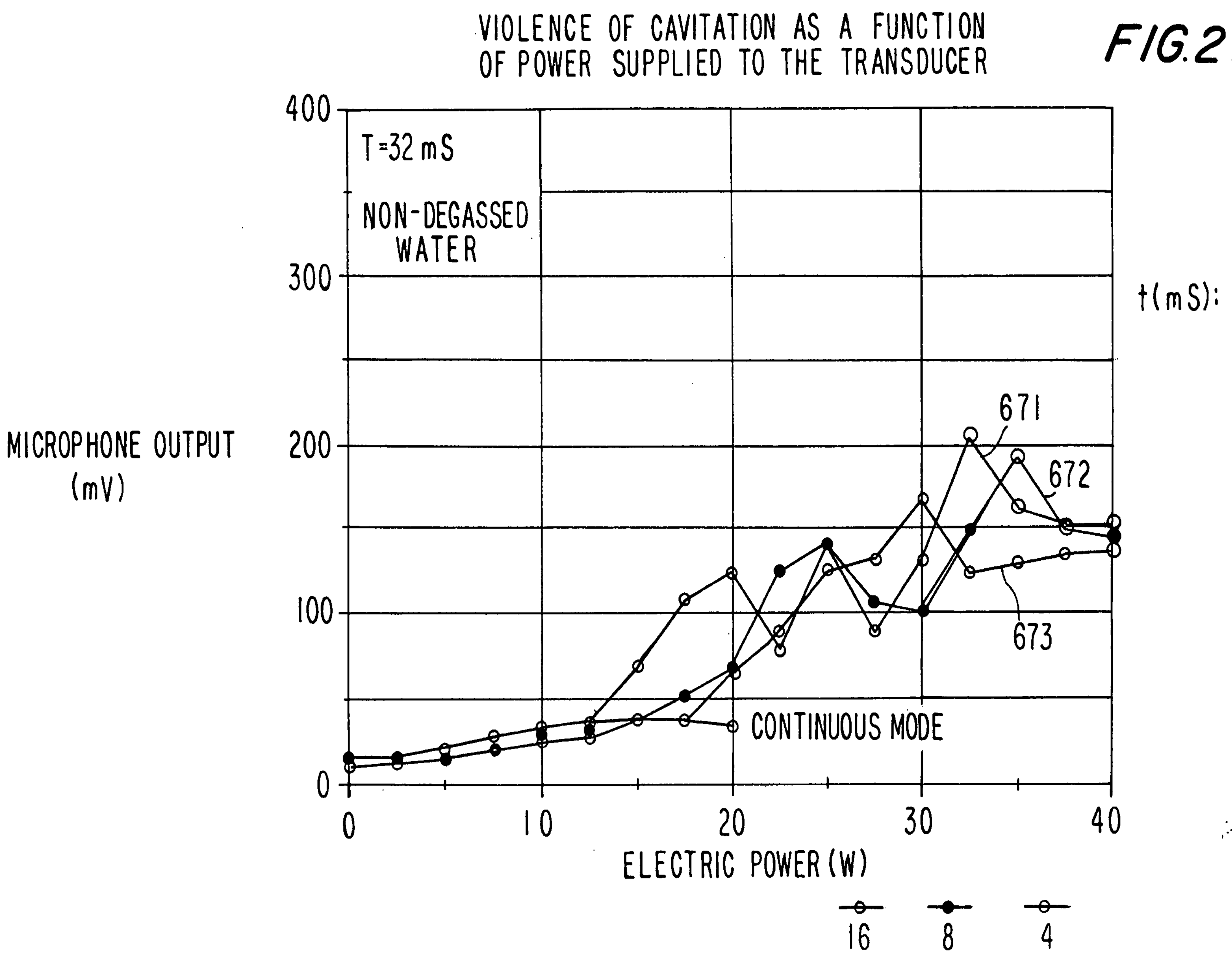

VIOLENCE OF CAVITATION AS A FUNCTION
OF POWER SUPPLIED TO THE TRANSDUCER
T=32 mS
NON-DEGASSED WATER
MICROPHONE OUTPUT (mV)
400
300
200
100
0
ELECTRIC POWER (W)
0
10
20
30
40
t(mS):
16
8
4
671
672
673
CONTINUOUS MODE

FIG. 28

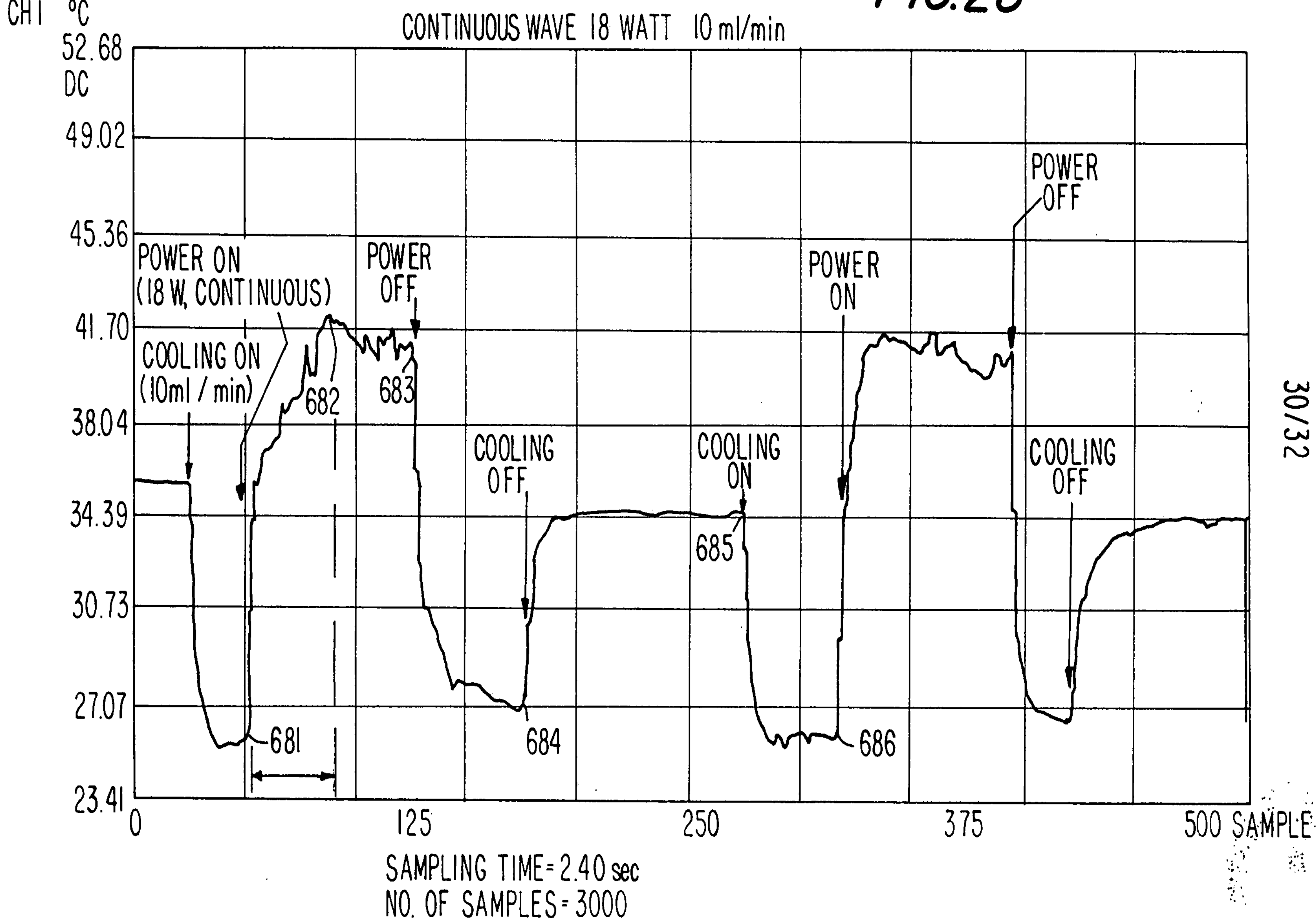

CONTINUOUS WAVE 18 WATT 10 ml/min
CH1 °C
52.68
DC
49.02
45.36
41.70
38.04
34.39
30.73
27.07
23.41
0
125
250
375
500 SAMPLE
POWER ON
(18 W, CONTINUOUS)
COOLING ON
(10ml / min)
POWER
OFF
COOLING
OFF
COOLING
ON
POWER
ON
POWER
OFF
COOLING
OFF
681
682
683
684
685
686
SAMPLING TIME=2.40 sec
NO. OF SAMPLES=3000

FIG.29

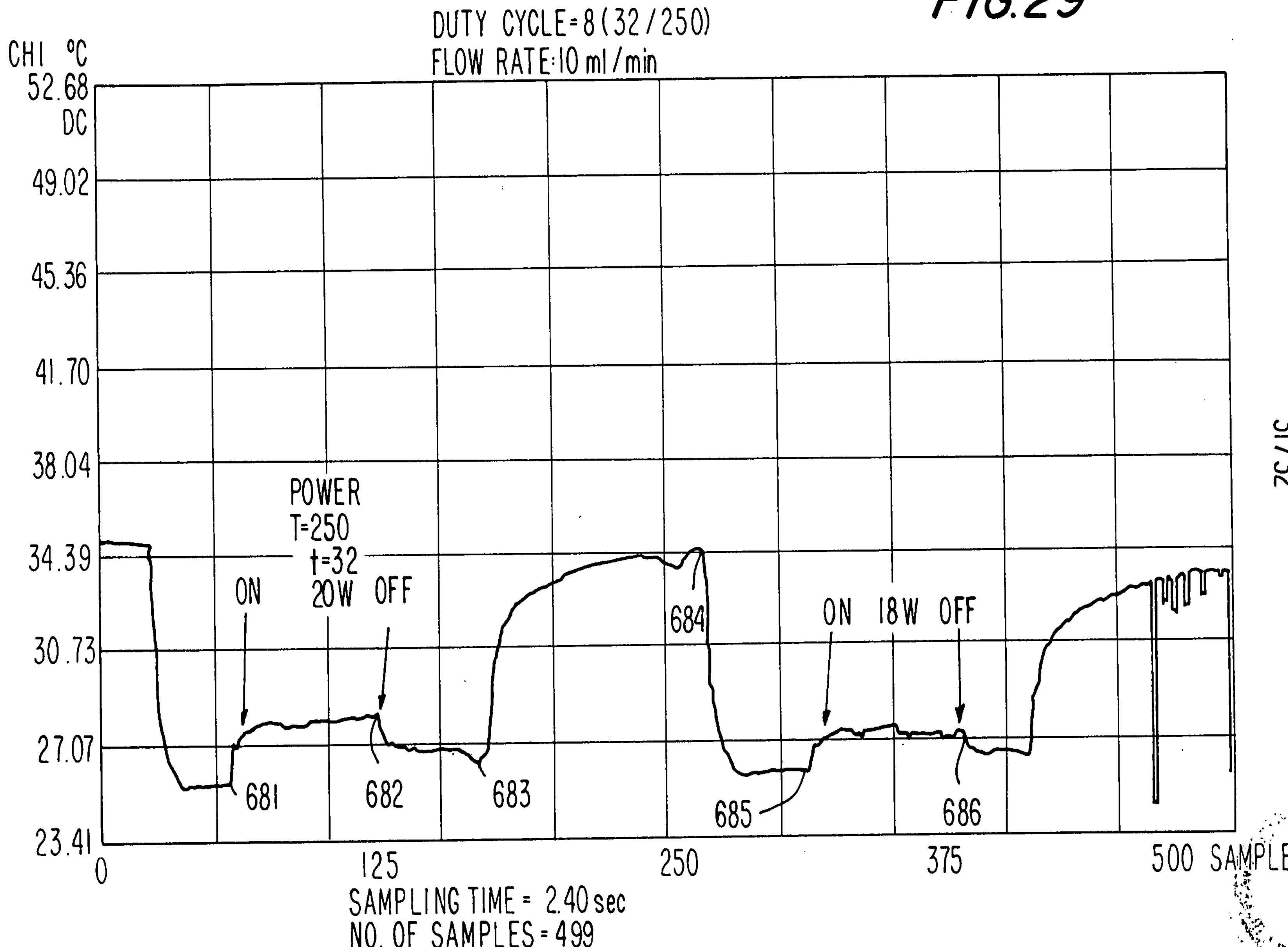
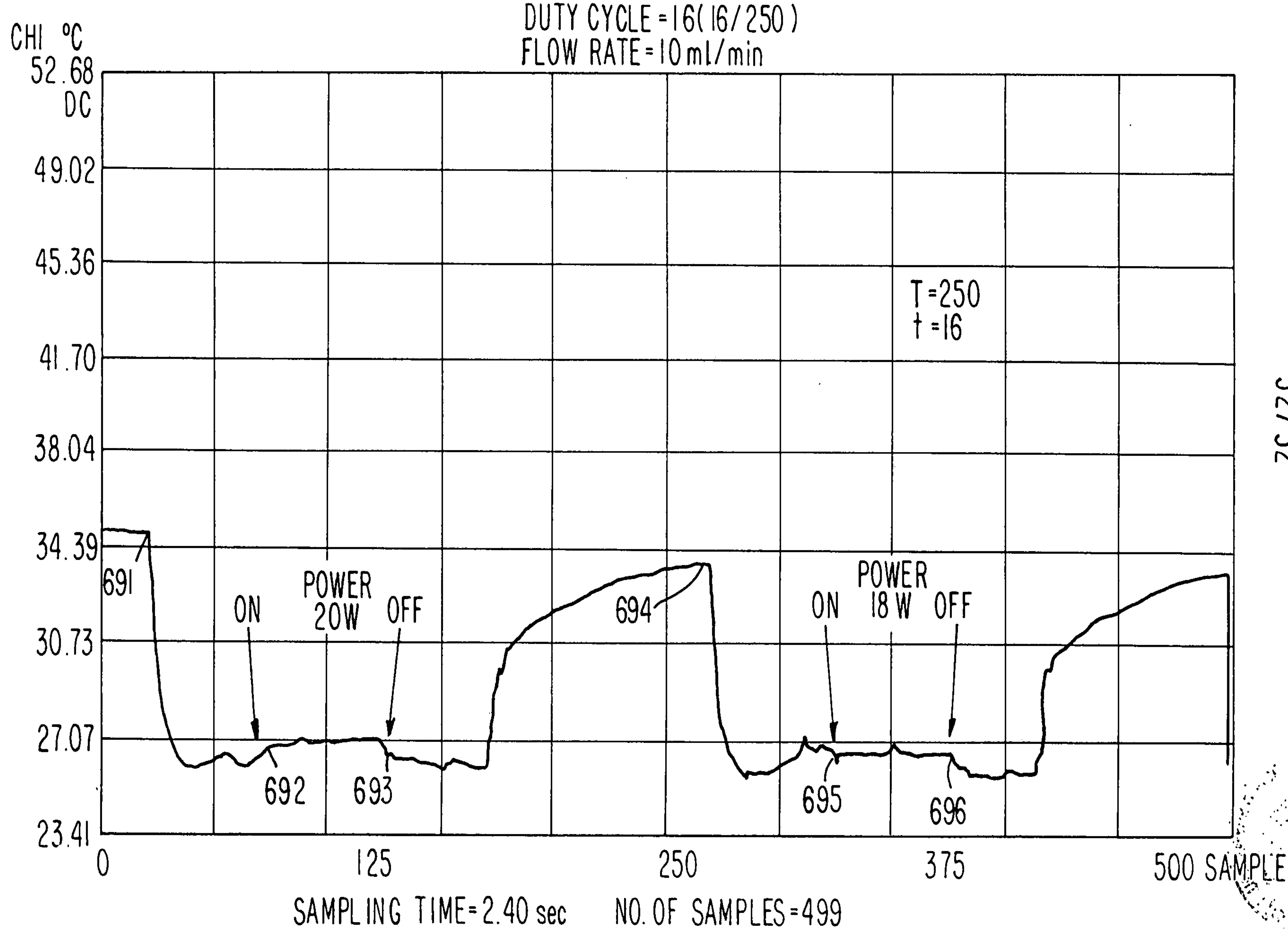

DUTY CYCLE=8(32/250)
FLOW RATE:10 ml/min
CHI °C
52.68
DC
49.02
45.36
41.70
38.04
34.39
30.73
27.07
23.41
0
125
250
375
500 SAMPLE
SAMPLING TIME = 2.40 sec
NO. OF SAMPLES=499
POWER
T=250
t=32
ON
20W OFF
681
682
683
684
685
ON 18W OFF
686

FIG.30


DUTY CYCLE = 16(16/250)
FLOW RATE = 10 ml/min
CHI °C
52.68
DC
49.02
45.36
41.70
38.04
34.39
30.73
27.07
23.41
0
125
250
375
500 SAMPLE
SAMPLING TIME = 2.40 sec
NO. OF SAMPLES = 499
T = 250
t = 16
691
ON
POWER
20W
OFF
692
693
694
ON
POWER
18 W
OFF
695
696